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Havakeshian, Golnar ; Koretsi, Vasiliki ; Eliades, Theodore ; Papageorgiou, Spyridon N

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Review

Effect of Orthopedic Treatment for Class III Malocclusion on Upper Airways: A Systematic Review and Meta-Analysis

Golnar Havakeshian, Vasiliki Koretsi, Theodore Eliades and Spyridon N. Papageorgiou *

Clinic of Orthodontics and Pediatric Dentistry, Center of Dental Medicine, University of Zurich, 8032 Zurich, Switzerland; g.havakeshian@hotmail.com (G.H.); koretsi.vasiliki@gmail.com (V.K.); theodore.eliades@zzm.uzh.ch (T.E.)

* Correspondence: snpapage@gmail.com

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Abstract: The aim of this systematic review is to compare the effect on the upper airways of orthopedic treatment for skeletal Class III malocclusion with untreated controls. Nine databases were searched up to August 2020 for randomized or nonrandomized clinical trials comparing orthopedic Class III treatment (facemask or chin-cup) to untreated Class III patients. After duplicate study selection, data extraction, and risk of bias assessment (Risk Of Bias In Non-randomized Studies - of Interventions [ROBINS-I]), random-effects meta-analyses of Mean Differences (MDs)/Standardized Mean Differences (SMD) and 95% Confidence Intervals (CIs) were performed, followed by the Grading of Recommendations Assessment, Development and Evaluation assessment evidence-quality. A total of 10 papers (9 unique nonrandomized studies) with 466 patients (42.7% male; average age 9.1 years) were finally included. Limited evidence indicated that compared to normal growth, maxillary protraction with facemask was associated with increases in total airway area (n = 1; MD = 222.9 mm^2; 95% CI = 14.0–431.7 mm^2), total nasopharyngeal area (n = 4; SMD = 1.6; 95% CI = 1.2–2.0), and individual airway dimensions (upper-airway MD = 2.5 mm; lower-airway MD = 2.1 mm; upper-pharynx MD = 1.6 mm; lower-pharynx MD = 1.0 mm; all n = 6). Subgroup/meta-regression analyses did not find any significant effect-modifiers, while the results were retained 2–5 years postretention. Our confidence in these estimates was, however, very low, due to the inclusion of nonrandomized studies with methodological issues. Limited data from 2 chin-cup studies indicated smaller benefits on airway dimensions. Existing evidence from controlled clinical studies on humans indicates that maxillary protraction for skeletal Class III treatment might be associated with increased airway dimensions, which are, however, mostly minor in magnitude.

Keywords: class III malocclusion; maxillary retrognathism; orthopedic treatment; dentofacial orthopedics; orthodontics; clinical trials; systematic review; meta-analysis

1. Introduction

1.1. Background

Skeletal Class III is multifactorial entity consisting of maxillary retroganthism, mandibular prognathism, or a combination thereof. Its treatment often poses a challenge for the orthodontist. Severe skeletal Class III might considerably affect many aspects of the patient's life, including, among others, psychosocial status, esthetics, mastication, speech and even breathing. The latter might be associated with significant differences in the morphological characteristics of the oropharyngeal airway of patients with Class III deformity. Data from Cone Beam Computerized Tomography (CBCT) indicate that Class III adults might have greater total oropharyngeal volume, but also greater constriction areas in the retroglossal and retropalatal compartment of the oropharynx [1]. The most constricted area of the oropharyngeal airway is usually located at the base of the tongue [2]. At the same time, a positive correlation has been reported among tongue volume, pharyngeal airway and Sella-Nasion-B point (SNB) angle, while a negative correlation has been reported between tongue volume and A point-Nasion-B point (ANB) angle [3]. Finally, Class III patients might have higher risk of being mouth breathers than Class I patients (32% and 23%, respectively) [4].

From the available Class III treatment options, orthopedic modification as well as orthognathic surgery might be expected to exert the greatest influence on the anatomy and volume of the airway. Specifically, significantly more orthognathic patients report a perceived improvement in breathing through maxillary advancement (with or without mandibular setback) (95%) than with mandibular setback alone (56%) [5]. Bimaxillary surgery results in greater increases than mandibular setback in the volume of the airway, which are primarily apparent due to an increase in the retropalatal region [6]. For growing Class III patients, orthopedic appliances are sometimes used to protract the maxilla, restrict or redirect mandibular growth, or both, while at the same time, both approaches lead to a mandibular rotation. However, consensus regarding the impact that these therapeutic approaches might have on the airway has not been reached in the literature. Some studies have reported a favorable effect on the dimensions of the airway [7–10], while others have not confirmed such an effect [11,12]. A recent systematic review on the topic [13] reported that maxillary protraction can increase postpalatal and nasopharyngeal airway dimensions in growing skeletal class III subjects with maxillary retrusion. However, that review included studies published only up to 2017, and its conclusions might be influenced by many existing issues like the lack of an a priori protocol [14], incomplete handling of risk of bias within studies according to the latest Cochrane guidelines [15], issues with the data synthesis (improper model selection, double-counting of multiple arms from single studies and a lack of sensitivity analyses) [16], and the lack of a formal assessment of the review's quality of evidence [17]. Finally, that review only assessed the impact of maxillary protraction on airway dimensions and did not include mandibular restriction with chin-cup.

1.2. Objective

The aim of this systematic review was to assess the effect of different orthopedic appliances on the upper airway dimension in growing patients with class III malocclusion. The research question was "can orthopedic treatment of growing Class III patients with facemask or chin-cup modify the upper airway dimensions to a degree greater than what can be attributed to normal growth?".

2. Materials and Methods

2.1. Protocol and Registration

A review protocol was designed and registered a priori (PROSPERO CRD42020148142), while post hoc changes were transparently reported (Supplementary Material S1). The conduct and reporting of this review is based on the Cochrane Handbook [18] and PRISMA statement [19], respectively.

2.2. Eligibility Criteria

Clinical studies on human pre-adolescent and adolescent patients of any sex or ethnicity with skeletal Class III malocclusion as an indication for orthopedic treatment were included (Supplementary Material S2). No limitations concerning language, publication year, or status were applied. The primary outcome of this review was total dimensions of the upper airways. Secondary outcomes included other dimensions of the separate airway compartments in linear or areal measurements.

2.3. Information Sources and Search

Nine electronic databases were systematically searched without any restrictions for publication date, type, and language from inception up to 4 August 2020 (Supplementary Material S3), while Directory of Open Access Journals, Digital Dissertations, metaRegister of Controlled Trials, World Health Organization, and Google Scholar, as well as the reference lists of eligible articles or existing systematic reviews were manually searched for any additions.

2.4. Study Selection

Two authors (GH., V.K.) screened the titles and/or abstracts of studies retrieved from the searches to identify articles that potentially met the inclusion criteria, before moving to their full-texts. Any differences between the two reviewers were resolved by discussion with a third author (S.N.P.).

2.5. Data Collection Process and Items

Data collection from the identified reports was conducted using predefined and piloted forms covering: (a) study characteristics (design, clinical setting, country), (b) patient characteristics (age, sex), (c) inclusion criteria / malocclusion characteristics, (d) treatment characteristics (appliance and duration), (e) post-treatment follow-up duration, and (f) outcome assessment. Data were extracted by two authors (G.H., V.K.) with the aforementioned way to resolve discrepancies.

2.6. Risk of Bias of Individual Studies

The risk of bias of included nonrandomized studies was assessed with the ROBINS-I ("Risk Of Bias In Nonrandomized Studies - of Interventions") [15]. Assessment of the risk of bias within individual studies was likewise independently performed by two authors (G.H., V.K.) with the same approach being applied to resolve discrepancies.

2.7. Data Synthesis and Summary Measures

An effort was made to include all existing trials in the analysis; where data were missing, they were calculated by us (Supplementary Material S1). As duration of orthopedic effects on the airways might be affected by patient anatomy or growth potential, appliance characteristics and patient compliance, a random-effects model was deemed appropriate to calculate the average distribution of true effects [20] with a restricted maximum likelihood variance estimator [21], using Mean differences (MDs) or Standardized Mean Differences (SMDs) and their corresponding 95% confidence intervals (CIs). The produced forest plots were augmented with contours denoting the magnitude of the observed effects to assess heterogeneity, clinical relevance and imprecision [16] (Supplementary Material S1).

The extent and impact of between-study heterogeneity was gauged visually and quantified with tau^2 (absolute heterogeneity) and the I^2 statistic (relative heterogeneity; inconsistency). Inconsistency over 75% was arbitrarily considered as high, but we also considered where the inconsistency was localized on the forest plot and our uncertainty around these estimates [22]. Ninety-five per cent predictive intervals, integral in the correct interpretation of random-effects meta-analyses [23], were estimated for meta-analyses of ≥3 trials to incorporate observed heterogeneity and provide a range of possible effects for a future clinical setting.

2.8. Additional Analyses and Risk of Bias Across Studies

Many subgroup and meta-regression analyses were originally planned (Supplementary Material S1), but only some could be performed in the end. Likewise, reporting biases were planned but could not be assessed in this review.

The overall quality of meta-evidence (i.e., the strength of clinical recommendations) was rated using the Grades of Recommendations, Assessment, Development, and Evaluation (GRADE) approach [17] following recent guidance on synthesizing nonrandomized studies [24] and summary of findings tables were constructed using an improved format [25] (Supplementary Material S1).

Robustness of the results was planned to be checked a priori with sensitivity analyses based on (a) baseline similarity of treated-control group in airway measurements, and (b) sample size, while some sensitivity analyses could not be performed (Supplementary Material S1).

All the analyses were run in Stata version 14.0 (StataCorp LP, College Station, TX) by one author (SNP) with an openly provided dataset [26]. All p values were two-sided with $\alpha = 5\%$, except for the test of between-studies or between-subgroups heterogeneity, where α-value was set at 10% [27].

3. Results

3.1. Study Selection

The electronic literature search yielded 849 results, while one study was manually identified (Figure 1). After duplicate removal and screening of titles/abstracts against the predefined eligibility criteria (Supplementary Material S4), the full texts of 104 papers were checked. Eventually, 10 papers pertaining to 9 unique studies (1 prospective and 9 retrospective nonrandomized studies; Table 1), which were published as journal papers, were finally included [8,11,12,28–34].

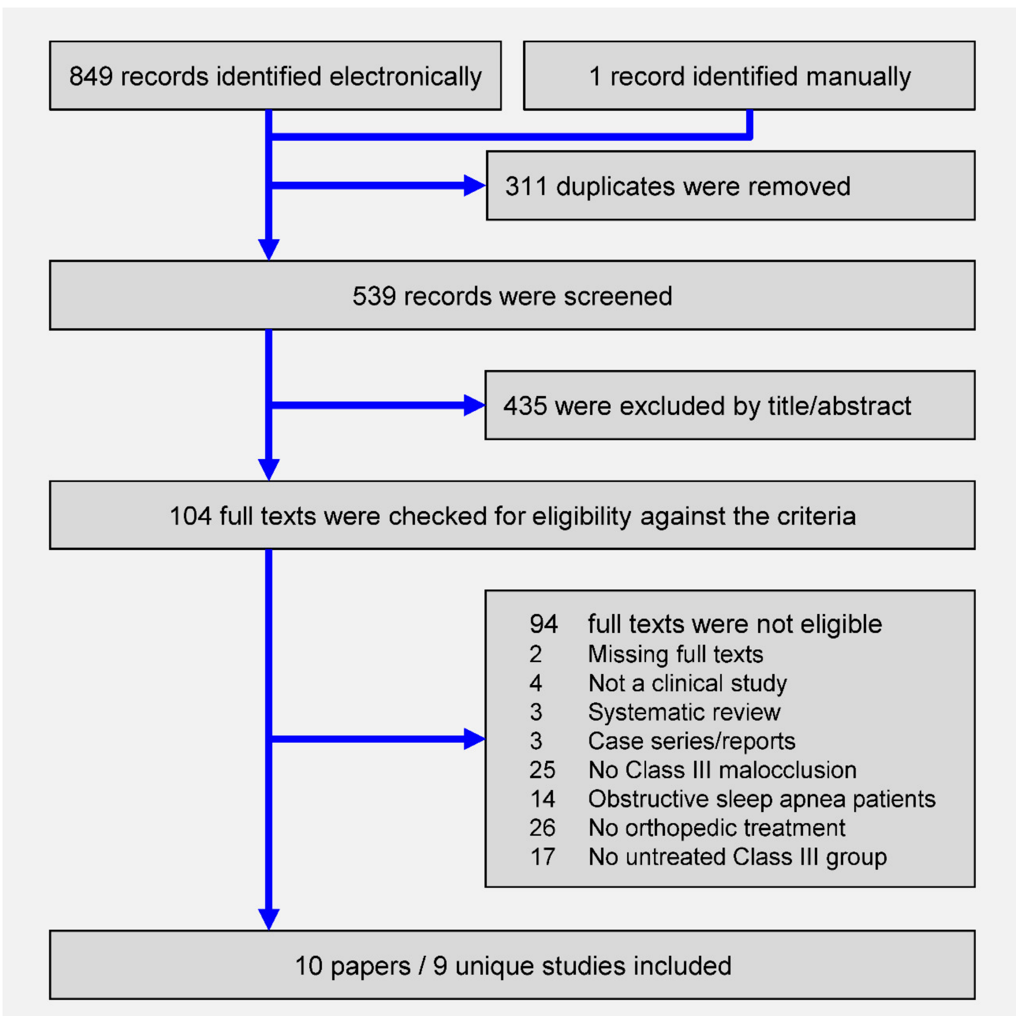

Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram for the identification and selection of studies.

3.2. Study Characteristics

All primary studies were conducted in university clinics (n = 9; 100%) and originated from four different countries (Iran, Italy, Spain, Turkey) (Table 1). A total of 321 treated and 145 untreated Class III patients were included, with a median total sample of 45 patients per included study (range 34 to 78 patients per study). All studies reported patient sex and age, with 199 of 466 patients (42.7%) being male and the mean patient age being 9.1 years.

Table 1. Characteristics of the included studies.

Study	Design; Setting; Country *	Patients (M/F); Age †	Inclusion Criteria	Appliance (Active Duration)	FU	Imaging Modality
Akin [28]	rNRS; Uni; TR	EG1: 25 (10/15); 10.3 EG2: 25 (9/16); 9.8 CG: 17 (8/9); 10.1	EG1-2/CG: −5° ≤ ANB ≤ 0°; Cl. III MoRel; edge-to-edge or aCB InRel; flat / mildly concave profile; successful Tx	EG1: FM + RME (NR) EG2: CC (NR) CG: (6.0 mos)	-	LC
Tuncer [9]	rNRS; Uni TR	EG: 20 (10/10); 10.3 CG: 18 (10/8); 9.9	EG/CG: mandibular prognathism without shift; neutral SN-ML	EG: CC + BP (9.8 mos) CG: (11.1)	-	LC
Tuncer [29]	rNRS; Uni TR	EG1: 17 (9/8); 11.3 EG2: 17 (10/7); 11.5 CG: 11(8/3); 9.1	EG1-2/CG: ANB < 0°; SNA < 82°; aCB InRel; HWR between PP2 and MP3cap; neutral (EG1)/high SN-ML (EG2);	EG1: FM + BP (9.7 mos) EG2: FM + BP (10.6 mos) CG: (12.0 mos)	-	LC
Danaei [30]	rNRS; Uni; IR	EG: 19 (6/13); 7.9 CG: 15 (4/11); 7.5	EG/CG: SNA < 77°, 76° ≤ SNB ≤ 80°, ANB < 1°; aCB InRel; Cl. III MoRel; no shift	EG: FM (10.5 mos) CG: (10.5 mos)	-	LC
Kilinc [31]	rNRS; Uni TR	EG: 18 (7/11); 10.5 CG: 17 (8/9); 10.9	EG/CG: maxillary skeletal retrusion; aCB InRel; Cl. III MoRel; HWR between PP2 and MP3cap	EG: FM + RME (6.9 mos) CG: (9.8 mos)	-	LC
Lombardo [32]	rNRS; Uni; IT	EG: 47 (22/25); 7.8 CG: 18 (9/9); 8.9	EG/CG: edge-to-edge or aCB InRel; Cl. III MoRel; WITS ≤ −2 mm; no shift; CVM stage 1–3	EG: FM + RME + BP (24.0 mos) CG: (25.2 mos)	5.4 yrs	LC
Menendez-Diaz [33]	rNRS; Uni ES	EG: 64 (10/34); 8.1 CG: 14 (8/6); 8.2	EG/CG: Cl. III; no shift	EG: FM + RME (18.0 mos) CG: (23.2 mos)	-	LC
Mucedero [11]; Baccetti [12]	rNRS; Uni; IT	EG1: 22 (10/12); 8.9 EG2: 17 (10/7); 7.1 CG: 20 (8/12); 8.1	EG1-2/CG: WITS ≤ −2 mm; edge-to-edge or aCB InRel; Cl. III MoRel	EG1: FM + BP (19.2 mos) EG2: FM + RME (25.2 mos) CG: (22.8 mos)	2.1 yrs	LC
Yagci [34]	pNRS; Uni; TR	EG1: 15 (7/8); 9.6 EG2: 15 (8/7); 9.5 CG: 15 (8/7); 9.8	EG/CG: Cl. III MoRel; edge-to-edge or aCB InRel; ANB ≤ 0°; N-Aperp ≤ −2 mm	EG1: FM1 + RME (13.4 mos) EG2: FM2 + RME (14.9 mos) CG: (11.64)	-	LC

* given with the country's ISO 3166 alpha-2 code. † given as mean (one value) or if mean not reported given as range (two values in parenthesis). aCB, anterior cross bite; ANB, A point-Nasion-B point angle; BP, Bite plane or bite block; CC, chin cup; CG, control group; Cl., Angle's Class; CVM, cervical vertebrae maturation index; EG, experimental group; FM, facemask or other maxillary protraction appliance; HWR, hand-wrist radiograph; InRel, incisor relationship; LC, lateral ceph; mo, month; MoRel, molar relationship; MP3, middle phalanx of the third finger; NR, not reported; pNRS; prospective nonrandomized study; PP2, proximal phalanx of the second finger; RME, rapid maxillary expansion; rNRS, retrospective nonrandomized study; SNA, Sella-Nasion-A point angle; SNB, Sella-Nasion-B point angle; SN-ML, Sella-Nasion-mandibular plane angle; Tx, treatment; Uni, university clinic; yr, year.

Seven of the included studies assessed maxillary protraction with facemask / reverse headgear, one assessed mandibular restraint with chin-cup, and one included one facemask arm and one chin-cup arm. Among the eight facemask studies, four incorporated maxillary expansion, two included a bite-plane (or bite-blocks) and one included both maxillary expansion and bite-plane. Average treatment duration was 15.1 months for facemask treatment (7 studies; range 6.9 to 24.0 months) and 9.8 months for chin-cup (1 study), while the average observation period for the untreated controls was 14.7 months (9 studies; 6.0 to 25.2 months). All studies measured outcomes before and directly after treatment, while two studies additional remeasured outcomes postretention after an additional average period of 2.1 to 5.1 years. Finally, all studies assessed the effects of treatment on airways with lateral cephalograms.

3.3. Risk of Bias within Studies

The included nonrandomized trials presented several issues influencing their risk for bias (Table 2). All studies except one (*n* = 8; 89%) were retrospective, and patient selection could influence the results of treatment for most of them (*n* = 8; 89%). For at least three studies (33%), treated/control patients were followed/observed for different durations, while baseline differences in age, sex, malocclusion severity or airway measurements existed for 1–3 studies (11–33%). No study performed blinded outcome measurement, while for at least four studies (44%), the treated and control populations originated from different sources. All included studies were judged to be in critical risk of bias, as issues existed for at least three domains per study.

3.4. Results of Individual Studies and Data Synthesis

3.4.1. Maxillary Protraction with Facemask/Reverse Headgear

Eight studies provided various measurements of linear distances or area measurements of airways post-treatment or postretention. The results of the performed meta-analyses are given in Table 3, while the results of single studies that could not be pooled in meta-analyses are given in Supplementary Material S5.

Table 2. Detailed assessment of included nonrandomized studies with the ROBINS-I tool.

Reference	Akin [28]	Tuncer [9]	Tuncer [29]	Danaei [30]	Kilinc [31]	Lombardo [32]	Menendez-Diaz [33]	Mucedero [11]; Baccetti [12]	Yagci [34]
Was the study prospective?	N	N	N	N	N	N	N	N	Y
Was selection of patients based on any factor that could influence airways post treatment (age, sex, skeletal configuration, compliance, breakages)?	Y	PY	Y	Y	PY	PN	PY	PY	Y
Were treated/untreated groups clearly defined?	Y	Y	Y	Y	Y	Y	Y	Y	Y
Was the observation period similar for treated/untreated patients?	NI	Y	PN	PY	PN	Y	PN	PN	PY
Were treated/untreated patients similar in terms of baseline age?	Y	PY	PN	Y	Y	PY	Y	PY	Y
Were treated/untreated patients similar in terms of baseline sex?	Y	PY	PN	Y	N	PY	N	N	Y
Were treated/untreated patients similar in terms of dental/skeletal malocclusion?	Y	PY	N	NI	Y	PY	Y	Y	Y
Were treated/untreated patients similar in terms of baseline airways?	PN	PN	Y	Y	Y	PY	Y	Y	N
Was the use of any other appliances/adjuncts the same among treated/untreated patients?	NA	NA	NI	NI	NA	NA	NI	NA	NA
Was outcome measurement similar for treated/untreated patients?	Y	Y	Y	Y	Y	Y	Y	Y	Y
Was outcome measurement done blindly for both treated/untreated patients?	N	N	N	N	N	N	N	N	N
Were treated/untreated patients treated/observed at the same place/time?	NI	NI	N	NI	N	N	N	N	Y

N, no; NA, not applicable; NI, no information; PN, probably not; PY, probably yes; Y, yes.

Table 3. Random-effects meta-analyses on the effect of facemask (with / without maxillary expansion) on upper airway dimensions.

Outcome	*n*	Effect (95% CI)	*p*	I^2 (95% CI)	tau^2 (95% CI)	95% prediction
Post-treatment						
Total nasopharyngeal area (mm^2)	4	SMD = 1.62 (1.20, 2.04)	**<0.001**	23% (0%, 91%)	0.04 (0, 1.42)	0.34, 2.90
Adenoidal nasopharyngeal area (mm^2)	2	MD = 0.34 (−0.10, 0.77)	0.13	0% (0%, 99%)	0 (0, 7.60)	-
Aerial nasopharyngeal area (mm^2)	2	MD = 1.29 (0.80, 1.77)	**<0.001**	0% (0%, 99%)	0 (0, 14.38)	-
Oropharyngeal area (mm^2)	2	MD = -0.18 (−1.65, 1.29)	0.81	89% (24%, 100%)	1.00 (0.04, 141.23)	-
Upper adenoid size (AD2-H; mm)	3	MD = 0.59 (-0.52, 1.70)	0.30	57% (0%, 98%)	0.55 (0, 24.22)	−11.24, 12.42
Lower adenoid size (AD1-Ba; mm)	3	MD = 0.12 (−2.20, 2.44)	0.92	76% (0%, 99%)	3.11 (0, 76.33)	−26.88, 27.12
Upper airway dimension (PNS-AD2; mm)	6	MD = 2.45 (0.97, 3.92)	**0.001**	87% (64%, 97%)	2.83 (0.74, 15.17)	−2.67, 7.57
Lower airway dimension (PNS-AD1; mm)	6	MD = 2.10 (1.50, 2.70)	**<0.001**	5% (0%, 87%)	0.04 (0, 4.83)	1.11, 3.09
McNamara's upper pharynx dimension (mm)	6	MD = 1.59 (0.57, 2.62)	**0.002**	73% (15%, 95%)	1.08 (0.07, 7.56)	−1.63, 4.82
McNamara's lower pharynx dimension (mm)	6	MD = 1.02 (0.17, 1.88)	**0.02**	70% (16%, 94%)	0.69 (0.06, 4.90)	−1.58, 3.63
Postretention						
Upper adenoid size (AD2-H; mm)	2	MD = -1.13 (−4.25, 2.00)	0.48	72% (0%, 100%)	3.70 (0, 641.91)	-
Lower adenoid size (AD1-Ba; mm)	2	MD = -2.67 (−4.63, -0.70)	**0.008**	14% (0%, 99%)	0.31 (0, 275.16)	-
Upper airway dimension (PNS-AD2; mm)	2	MD = 3.71 (0.80, 6.62)	**0.01**	65% (0%, 100%)	2.91 (0, 563.83)	-
Lower airway dimension (PNS-AD1; mm)	2	MD = 3.59 (1.75, 5.44)	**<0.001**	0% (0%, 98%)	0 (0, 132.16)	-
McNamara's upper pharynx dimension (mm)	2	MD = 2.27 (0.80, 3.74)	**0.003**	0% (0%, 98%)	0 (0, 89.15)	-
McNamara's lower pharynx dimension (mm)	2	MD = 1.84 (−2.08, 5.75)	0.36	85% (NC)	6.80 (NC)	-

CI, confidence interval; MD, mean difference; SMD, standardized mean difference. Statistical significance is denoted in bold.

The review's primary outcome of total airway area was assessed by a single study, which found a statistically and clinically relevant increase in airway area post-treatment (MD = 222.86 mm^2; 95% CI = 14.04–431.68 mm^2; $p = 0.04$). As far as secondary outcomes, statistically significant post-treatment increases were seen for the facemask group compared to the control group regarding total nasopharyngeal area (4 studies; SMD = 1.62; 95% CI = 1.20–2.04; $p < 0.001$; $I^2 = 23\%$; Supplementary Material S6), aerial nasopharyngeal area (2 studies; MD = 1.29 mm^2; 95% CI = 0.80–1.77 mm^2; $p < 0.001$; $I^2 = 0\%$), upper airway dimensions (6 studies; MD = 2.45 mm; 95% CI = 0.97–3.92 mm; $p = 0.001$; $I^2 = 87\%$; Supplementary Material S7), lower airway dimensions (6 studies; MD = 2.10 mm; 95% CI = 1.50–2.70 mm; $p < 0.001$; $I^2 = 5\%$; Supplementary Material S8), McNamara's upper pharynx dimensions (6 studies; MD = 1.59 mm; 95% CI = 0.57–2.62 mm; $p = 0.002$; $I^2 = 73\%$; Supplementary Material S9), and McNamara's lower pharynx dimensions (6 studies; MD = 1.02 mm; 95% CI = 0.17–1.88 mm; $p = 0.02$; $I^2 = 70\%$; Supplementary Material S10). Observed heterogeneity was acceptable in all instances, except for the meta-analysis of upper airway dimensions ($I^2 = 87\%$), but all studies were on the right side of the forest plot (Supplementary Material S7), so judgment about the beneficial effects of treatment was not influenced by it, but rather, only the precise quantification of the treatment's effects. The 95% prediction intervals were inconsistent (included both negative and negative values) for most meta-analyses, with only total pharyngeal area and lower airway dimension being consistent, meaning that we can consistently expect significant benefits in every future scenario.

Apart from these meta-analyses, individual studies reported on several increases in airway dimensions (Supplementary Material S5) that were either statistically nonsignificant or clinically nonrelevant, apart from a relevant increase in oropharynx dimensions.

Finally, postretention data 2.1 to 5.4 years after treatment were available from two studies (Table 3). Lower adenoid side was significantly lower in treated patients compared to controls (2 studies; MD = −2.67 mm; 95% CI = −4.63 – −0.70 mm; $p = 0.008$), a novel finding that was not seen directly post-treatment. The dimensions of the upper and lower airways were still significantly larger among treated than untreated patients and to a greater extent than directly post-treatment (MD of 3.71 mm versus 2.45 mm for the upper airway; MD of 3.59 mm versus 2.10 mm for the lower airway). Treatment-related benefits in the dimensions of the pharynx were likewise increased postretention, though this increase was statistically significant only for the upper pharynx.

3.4.2. Mandibular Restraint with Chin-Cup

Two studies provided various measurement on linear distances or area measurements of airways post-treatment (Supplementary Material S11), most of which were not significant—with two exceptions. One study reported a post-treatment increase of the nasopharyngeal area (MD = 10183.0 mm^2; 95% CI = 10074.3–10291.8 mm^2; $p < 0.001$), which was both statistically significant and clinically relevant. The same study reported a post-treatment reduction of the oropharyngeal area (MD = −8231.0 mm^2; 95% CI = −10616.5 – −5845.5 mm^2; $p < 0.001$), which was statistically significant but clinically irrelevant.

3.5. Additional Analyses, Risk of Bias across Studies, and Quality of Evidence

Several subgroup analyses, meta-regressions and assessments for reporting biases were originally planned in the protocol, but could ultimately not be performed (Supplementary Material S1). Selected subgroup and meta-regression analyses on the post-treatment effects of maxillary protraction (for meta-analyses with ≥5 studies) found no significant influence of patient age, sex, baseline airway dimensions, inclusion of maxillary expansion or treatment duration (Table 4). Likewise, one study found no significant differences between normodivergent or hyperdivergent patients, and another study found no significant differences between two facemask designs.

Table 4. *p* values from subgroup analyses and meta-regressions.

Outcome	Age	Male%	Baseline Airway	RME	Tx Duration
Upper airway dimension (PNS-AD2; mm)	0.45	0.65	0.69	0.29	0.27
Lower airway dimension (PNS-AD1; mm)	0.98	0.15	0.37	0.65	0.26
McNamara's upper pharynx dimension (mm)	0.46	0.23	0.46	0.81	0.33
McNamara's lower pharynx dimension (mm)	0.13	0.65	0.45	0.70	0.67

RME, rapid maxillary expansion, Tx, treatment.

The quality of evidence (Table 5) for the main analyses on the post-treatment effects of facemask was, in all cases, very low, due to the inclusion of retrospective nonrandomized studies with critical risk of bias. The quality of evidence about the primary outcome of total airway area was additionally downgraded due to imprecision, as a single study with a limited sample size contributed to this. The GRADE analysis indicates that further research in terms of well-designed studies is very likely to have an important impact which will likely change our current estimates of effect.

Table 5. Summary of Findings Table according to GRADE approach.

Outcome Studies (patients)	Anticipated Absolute Effects (95% CI) Control (growth)	 Maxillary protraction	Quality of the evidence (GRADE) [b]	What happens with maxillary protraction
Total airway area 35 patients (1 study)	−38.4 mm ^{2}	223 mm^2 greater (14.0 to 431.7 mm^2 greater)	○○○○ very low [c,d] due to bias, imprecision	Might be associated with greater airway area
Upper airway dimensions 316 patients (6 studies)	0.3 mm [a]	2.5 mm greater (1.0 to 3.9 mm greater)	○○○○ very low [c] due to bias	Might be associated with greater upper airway dimensions
Lower airway dimensions 316 patients (6 studies)	0.5 mm [a]	2.1 mm greater (1.5 to 2.7 mm greater)	○○○○ very low [c] due to bias	Might be associated with greater lower airway dimensions
Upper pharynx dimensions (McNamara's) 323 patients (6 studies)	0.6 mm [a]	1.6 mm greater (0.6 to 2.6 mm greater)	○○○○ very low [c] due to bias	Might be associated with greater upper pharynx dimensions
Lower pharynx dimensions (McNamara's) 323 patients (6 studies)	0.1 mm [a]	1.0 mm greater (0.2 to 13.9 mm greater)	○○○○ very low [c] due to bias	Might be associated with greater lower pharynx dimensions

Intervention: orthopedic maxillary protraction with facemask or reverse headgear/Population: pre-adolescent children with skeletal Class III malocclusion / Setting: university clinics (Iran, Italy, Spain, Turkey). [a] Response in the control group is based on random-effects meta-analysis of the control groups of included studies. [b] Starts from "high". [c] Downgraded by three levels for bias due to the inclusion of retrospective nonrandomized studies with serious risk of bias. [d] Downgraded by one level for imprecision due to the inclusion of an inadequate sample. CI, confidence interval; GRADE, Grading of Recommendations Assessment, Development and Evaluation, ○○○○, downgraded by 4 points.

3.6. Sensitivity Analysis

A sensitivity analysis according to sample size and baseline similarity of treated/control patients (Supplementary Material S12) indicated relative robustness of the results.

4. Discussion

4.1. Evidence in Context

The current review summarizes and critically appraises existing evidence from clinical research comparing the effects of Class III orthopedic treatment on airway dimensions to untreated Class III controls. A total of 10 papers (9 studies) including 321 treated and 145 untreated Class III patients were finally identified as eligible and contributed to data synthesis.

Maxillary protraction with a facemask, with or without an expander, was shown to result in statistically significant increases in airway dimensions directly after treatment compared to what could be expected by Class III growth alone. Specifically, benefits were seen for total nasopharyngeal area, upper/lower airway dimensions and upper/lower pharynx dimensions (Table 3). However, most of these changes were small to moderate in magnitude, which means that they might have little clinical relevance (Supplementary Materials S7–S10). The only exception was the increase in total nasopharyngeal area, where a large to very large effect was (Supplementary Material S6) found. This indicates that any clinically relevant benefits in airway dimensions or breathing might be located in this compartment. Evidence from the existing literature indicates that significant differences exist in the dimensions of the pharyngeal airway and the thickness of the pharyngeal wall among normal patients and patients with sleep-disordered breathing [35], with the lower retropalatal and retroglossal areas being affected the most [36]. Even though these regions were only minimally affected, the large improvements at the nasopharyngeal area might be highly relevant, since the nasopharyngeal dimensions appear to be the most sensitive parameter for assessments of the patient’s respiratory conditions [37]. However, even though dimensional changes might be indicative of improved breathing, proper confirmation must follow using functional analyses of nasal airflow resistance and nasal pressure.

The initial effects on the airways observed after treatment were, for the most part, retained after a follow-up period of 2–5 years, while in some instances, the difference between treated and untreated Class III patients even increased (Table 3). This might indicate that early orthopedic modification of a maxillary retrusion might be associated with a more favorable growth pattern, even though this is speculative at the present time. A long-term follow-up from a well-known randomized trial on maxillary protraction indicated relatively similar change patterns for SNA, SNB and ANB angles from 8 to 14 years of age for treated and untreated Class III patients, with mandibular rotation being the most pronounced difference [38]. Different extents of mandibular rotation, as expressed through the patient’s growth pattern, were observed to be differently related to airway dimensions in Class I patients [39]. Apart from that, therapeutic effects should always be considered in the context of physiological growth. The dimensions of the nasopharyngeal compartment are not stable during growth [40,41], and patient age at the time of the investigation could play a role in the interpretation of the results.

The effects of orthopedic maxillary traction on the airways were relatively consistent, despite the big variability of the included studies regarding patient characteristics (age, sex, baseline airway dimensions) and treatment protocol (simultaneous use of maxillary expansion or treatment duration), as no clear modification was seen through the subgroup/meta-regression analyses (Table 4). Previous studies have indicated that maxillary expansion can have a beneficial effect on upper airway dimensions [42], but whether additional gains can be expected during maxillary protraction by also incorporating expansion remains questionable. It must be also noted here that alternating rapid maxillary expansion and constriction might be more beneficial than conventional rapid maxillary expansion in terms of skeletal effects [43], but no included studies used this protocol.

Restricting or redirecting mandibular growth with a chin-cup had a considerably smaller impact on the airways than maxillary protraction, since only two statistically significant differences directly post-treatment were found, and only one was clinically relevant (the increase in nasopharyngeal area) (Supplementary Material S11). However, it must be noted that only two small studies were included in this review, which might indicate an absence of evidence, and not necessarily evidence of absence. Chin-cup treatment has been reported to induce certain skeletal adaptations [44,45], the long-term stability of which, however, is questionable. At the present time, there is not enough evidence to suggest that chin-cup treatment negatively influences airway dimensions.

4.2. Strengths and Limitations

This systematic review has several strengths, comprising an a priori registered protocol [14], a comprehensive literature search, the inclusion of an untreated Class III control group, the use of modern analytic methods [21], the application of the GRADE approach to assess the strength of provided recommendations [17, and the transparent provision of all data [46].

Some limitations exist nonetheless. For one, methodological issues, which might influence the present conclusions, existed in all the included studies. This is especially the case in the included retrospective nonrandomized studies [47,48]. The inclusion of nonrandomized studies in meta-analyses is not considered prohibitory per se, provided that robust bias appraisal has been performed and recent guidance has been provided on how to appropriately incorporate such designs [24]. Furthermore, most meta-analyses were predominantly based on small trials, which might affect the precision of the estimates [49]. Additionally, the small number of trials ultimately included in the meta-analyses and their incomplete reporting of results and potential confounders (baseline malocclusion severity or other patient characteristics and different orthopedic treatment protocols) prevented us from conducting many analyses for subgroups and meta-regressions. Last but not least, this study, although it was originally otherwise planned, only included lateral cephalograms for evaluating airway dimensions because no eligible controlled study with CBCTs could be found. Lateral cephalograms are abundantly available because they are part of patients' usual records, but only a moderately high correlation is to be expected between cephalometric and CBCT measurements in the assessment of the airway dimensions [50].

5. Conclusions

Current evidence indicates that orthopedic treatment with maxillary protraction for Class III malocclusion might be associated with increased dimensions of the upper airways, which seem to be retained after treatment. However, our confidence in these data is very low due to the poor quality of existing studies and their small number. Restriction of mandibular growth with chin-cup seems likewise to be associated to some extent with increased airway dimensions, but these effects are less pronounced. It is crucial that the clinical relevance of such anatomical changes be confirmed by functional analyses of breathing ability before concrete recommendations can be formulated.

Supplementary Materials: The following are available online at www.mdpi.com/2077-0383/9/9/3015/s1, Supplementary Material S1: Additional review details and deviations from the protocol, Supplementary Material S2: Eligibility criteria for the inclusion of primary studies, Supplementary Material S3: Literature search (as of 4 August 2020) for each database with the corresponding hits, Supplementary Material S4: List of studies identified from the literature search and their inclusion/exclusion status with reasons, Supplementary Material S5: Results of individual studies comparing maxillary protraction to untreated controls that are not included in meta-analyses, Supplementary Material S6: Contour-enhanced forest plot for the comparison of maxillary protraction with facemask versus changes in untreated controls in terms of total nasopharyngeal area, Supplementary Material S7: Contour-enhanced forest plot for the comparison of maxillary protraction with facemask versus changes in untreated controls in terms of upper airway dimension, Supplementary Material S8: Contour-enhanced forest plot for the comparison of maxillary protraction with facemask versus changes in untreated controls in terms of lower airway dimension, Supplementary Material S9: Contour-enhanced forest plot for the comparison of maxillary protraction with facemask versus changes in untreated controls in terms of McNamara's upper pharynx dimension, Supplementary Material S10: Contour-enhanced forest plot for the comparison of maxillary protraction with facemask versus changes in untreated controls in terms of

McNamara's lower pharynx dimension, Supplementary Material S11: Results of individual studies comparing chin-cup to untreated controls that are not included in meta-analyses, Supplementary Material S12: Sensitivity analyses of meta-analyses post-treatment with at least 3 studies.

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References

1. Jayaratne, Y.S.N.; Zwahlen, R.A. The oropharyngeal airway in young adults with skeletal Class II and Class III deformities: A 3-D morphometric analysis. *PLoS ONE* **2016**, *11*, e0148086, doi:10.1371/journal.pone.0148086.
2. El, H.; Palomo, J.M. Airway volume for different dentofacial skeletal patterns. *Am. J. Orthod. Dentofac. Orthop.* **2011**, *139*, e511–e521, doi:10.1016/j.ajodo.2011.02.015.
3. Iwasaki, T.; Suga, H.; Yanagisawa-Minami, A.; Sato, H.; Sato-Hashiguchi, M.; Shirazawa, Y.; Tsujii, T.; Yamamoto, Y.; Kanomi, R.; Yamasaki, Y. Relationships among tongue volume, hyoid position, airway volume and maxillofacial form in paediatric patients with Class-I, Class-II and Class-III malocclusions. *Orthod. Craniofacial Res.* **2018**, *22*, 9–15, doi:10.1111/ocr.12251.
4. Pacheco, M.C.T.; Fiorott, B.S.; Finck, N.S.; De Araújo, M.T.M. Craniofacial changes and symptoms of sleep-disordered breathing in healthy children. *Dent. Press J. Orthod.* **2015**, *20*, 80–87, doi:10.1590/2176-9451.20.3.080-087.oar.
5. Dantas, J.; Neto, J.; De Carvalho, S.; Martins, I.; De Souza, R.; Sarmento, V.A. Satisfaction of skeletal class III patients treated with different types of orthognathic surgery. *Int. J. Oral Maxillofac. Surg.* **2015**, *44*, 195–202, doi:10.1016/j.ijom.2014.09.015.
6. Havron, A.G.; Aronovich, S.; Shelgikar, A.V.; Kim, H.L.; Conley, R.S. 3D airway changes using CBCT in patients following mandibular setback surgery ± maxillary advancement. *Orthod. Craniofacial Res.* **2019**, *22*, 30–35, doi:10.1111/ocr.12291.
7. Hiyama, S.; Suda, N.; Ishii-Suzuki, M.; Tsuiki, S.; Ogawa, M.; Suzuki, S.; Kuroda, T. Effects of maxillary protraction on craniofacial structures and upper-airway dimension. *Angle Orthod.* **2002**, *72*, 43–47.
8. Lanteri, V.; Farronato, M.; Ugolini, A.; Cossellu, G.; Gaffuri, F.; Parisi, F.M.R.; Cavagnetto, D.; Abate, A.; Maspero, C. Volumetric changes in the upper airways after rapid and slow maxillary expansion in Growing patients: A case-control study. *Materials* **2020**, *13*, 2239, doi:10.3390/ma13102239.
9. Tuncer, B.B.; Kaygisiz, E.; Tuncer, C.; Yüksel, S. Pharyngeal airway dimensions after chin cup treatment in Class III malocclusion subjects. *J Oral Rehabil.* **2009**, *36*, 110–117, doi:10.1111/j.1365-2842.2008.01910.x.
10. Maspero, C.; Farronato, M.; Bellincioni, F.; Annibale, A.; Machetti, J.; Abate, A.; Cavagnetto, D.; Maspero, C. Three-dimensional evaluation of maxillary sinus changes in growing subjects: A retrospective cross-sectional study. *Mater.* **2020**, *13*, 1007, doi:10.3390/ma13041007.
11. Mucedero, M.; Baccetti, T.; Franchi, L.; Cozza, P. Effects of maxillary protraction with or without expansion on the sagittal pharyngeal dimensions in Class III subjects. *Am. J. Orthod. Dentofac. Orthop.* **2009**, *135*, 777–781, doi:10.1016/j.ajodo.2008.11.021.
12. Baccetti, T.; Franchi, L.; Mucedero, M.; Cozza, P. Treatment and post-treatment effects of facemask therapy on the sagittal pharyngeal dimensions in Class III subjects. *Eur. J. Orthod.* **2010**, *32*, 346–350, doi:10.1093/ejo/cjp092.
13. Ming, Y.; Hu, Y.; Li, Y.; Yu, J.; He, H.; Zheng, L. Effects of maxillary protraction appliances on airway dimensions in growing class III maxillary retrognathic patients: A systematic review and meta-analysis. *Int. J. Pediatr. Otorhinolaryngol.* **2018**, *105*, 138–145, doi:10.1016/j.ijporl.2017.12.013.
14. Sideri, S.; Papageorgiou, S.N.; Eliades, T. Registration in the international prospective register of systematic reviews (PROSPERO) of systematic review protocols was associated with increased review quality. *J. Clin. Epidemiol.* **2018**, *100*, 103–110, doi:10.1016/j.jclinepi.2018.01.003.

15. Sterne, J.A.C.; Hernán, M.A.; Reeves, B.C.; Savović, J.; Berkman, N.D.; Viswanathan, M.; Henry, D.; Altman, D.G.; Ansari, M.T.; Boutron, I.; et al. ROBINS-I: A tool for assessing risk of bias in non-randomised studies of interventions. *BMJ* **2016**, *355*, i4919, doi:10.1136/bmj.i4919.
16. Papageorgiou, S.N. Meta-analysis for orthodontists: Part II—Is all that glitters gold? *J. Orthod.* **2014**, *41*, 327–336, doi:10.1179/1465313314y.0000000110.
17. Guyatt, G.H.; Oxman, A.D.; Schünemann, H.; Tugwell, P.; Knottnerus, A. GRADE guidelines: A new series of articles in the Journal of Clinical Epidemiology. *J. Clin. Epidemiology* **2011**, *64*, 380–382, doi:10.1016/j.jclinepi.2010.09.011.
18. Higgins, J.P.T.; Green, S. *Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0*; The Cochrane Collaboration: London, UK, 2011.
19. Liberati, A.; Altman, D.G.; Tetzlaff, J.; Mulrow, C.; Gøtzsche, P.C.; Ioannidis, J.P.; Clarke, M.J.; Devereaux, P.J.; Kleijnen, J.; Moher, D. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. *J. Clin. Epidemiol.* **2009**, *62*, e1–e34, doi:10.1016/j.jclinepi.2009.06.006
20. Papageorgiou, S.N. Meta-analysis for orthodontists: Part I—How to choose effect measure and statistical model. *J. Orthod.* **2014**, *41*, 317–326, doi:10.1179/1465313314y.0000000111.
21. Langan, D.; Higgins, J.P.T.; Jackson, D.; Bowden, J.; Veroniki, A.A.; Kontopantelis, E.; Viechtbauer, W.; Simmonds, M. A comparison of heterogeneity variance estimators in simulated random-effects meta-analyses. *Res. Synth. Methods* **2018**, *10*, 83–98, doi:10.1002/jrsm.1316.
22. Higgins, J.P.T.; Thompson, S.G.; Deeks, J.J.; Altman, D.G. Measuring inconsistency in meta-analyses. *BMJ* **2003**, *327*, 557–560, doi:10.1136/bmj.327.7414.557.
23. IntHout, J.; Ioannidis, A.; J.P.; Rovers, M.M.; Goeman, J.J. Plea for routinely presenting prediction intervals in meta-analysis. *BMJ Open* **2016**, *6*, doi:10.1136/bmjopen-2015-010247.
24. Schünemann, H.J.; Cuello-Garcia, C.A.; A Akl, E.; A Mustafa, R.; Meerpohl, J.J.; Thayer, K.A.; Morgan, R.L.; Gartlehner, G.; Kunz, R.; Katikireddi, S.V.; et al. GRADE guidelines: 18. How ROBINS-I and other tools to assess risk of bias in nonrandomized studies should be used to rate the certainty of a body of evidence. *J. Clin. Epidemiol.* **2018**, *111*, 105–114, doi:10.1016/j.jclinepi.2018.01.012.
25. Carrasco-Labra, A.; Brignardello-Petersen, R.; Santesso, N.; Neumann, I.; A Mustafa, R.; Mbuagbaw, L.; Etxeandia-Ikobaltzeta, I.; De Stio, C.; Mccullagh, L.J.; Alonso-Coello, P.; et al. Improving GRADE evidence tables part 1: A randomized trial shows improved understanding of content in summary of findings tables with a new format. *J. Clin. Epidemiol.* **2016**, *74*, 7–18, doi:10.1016/j.jclinepi.2015.12.007.
26. Havakeshian, G.; Koretsi, V.; Eliades, T.; Papageorgiou, S.N. Effect of orthopedic treatment for Class III malocclusion on upper airways: A systematic review and meta-analysis [dataset]. doi:10.5281/zenodo.3988959.
27. Ioannidis, J.P.A. Interpretation of tests of heterogeneity and bias in meta-analysis. *J. Eval. Clin. Pract.* **2008**, *14*, 951–957, doi:10.1111/j.1365-2753.2008.00986.x.
28. Akin, M.; Ucar, F.; Chousein, C.; Sari, Z. Effects of chincup or facemask therapies on the orofacial airway and hyoid position in Class III subjects. *J. Orofac. Orthop* **2015**, *76*, 520–530, doi:10.1007/s00056-015-0315-3.
29. Tuncer, B.B.; Ulusoy, Çağrı; Tuncer, C.; Türköz, Çağrı; Varlik, S.K. Effects of reverse headgear on pharyngeal airway in patients with different vertical craniofacial features. *Braz. Oral Res.* **2015**, *29*, 1–8, doi:10.1590/1807-3107bor-2015.vol29.0057.
30. Danaei, S.M.; Ajami, S.; Etemadi, H.; Azadeh, N. Assessment of the effect of maxillary protraction appliance on pharyngeal airway dimensions in relation to changes in tongue posture. *Dent. Res. J.* **2018**, *15*, 208–214, doi:10.4103/1735-3327.231859.
31. Kilinc, A.S.; Arslan, S.G.; Kama, J.D.; Ozer, T.; Dari, O. Effects on the sagittal pharyngeal dimensions of protraction and rapid palatal expansion in Class III malocclusion subjects. *Eur J. Orthod* **2008**, *30*, 61–6, doi:10.1093/ejo/cjm076.
32. Lombardo, E.; Franchi, L.; Lione, R.; Chiavaroli, A.; Cozza, P.; Pavoni, C. Evaluation of sagittal airway dimensions after face mask therapy with rapid maxillary expansion in Class III growing patients. *Int J. Pediatr Otorhinolaryngol.* **2020**, *130*, 109794, doi:10.1016/j.ijporl.2019.109794.
33. Menendez-Diaz, I.; Muriel, J.; Cobo, J.L.; Alvarez, C.; Cobo, T. Early treatment of Class III malocclusion with facemask therapy. *Clin. Exp. Dent. Res.* **2018**, *4*, 279–283, doi:10.1002/cre2.144.
34. Yagci, A.; Uysal, T.; Usumez, S.; Orhan, M. Effects of modified and conventional facemask therapies with expansion on dynamic measurement of natural head position in Class III patients. *Am. J. Orthod Dentofac. Orthop.* **2011**, *140*, e223–e231, doi:10.1016/j.ajodo.2011.05.018.

35. Schwab, R.J.; Gupta, K.B.; Gefter, W.B.; Metzger, L.J.; Hoffman, E.A.; Pack, A.I. Upper airway and soft tissue anatomy in normal subjects and patients with sleep-disordered breathing. Significance of the lateral pharyngeal walls. *Am. J. Respir. Crit. Care Med.* **1995**, *152*, 1673–1689, doi:10.1164/ajrccm.152.5.7582313.
36. Schwab, R.J.; Gefter, W.B.; Hoffman, E.A.; Gupta, K.B.; Pack, A.I. Dynamic upper airway imaging during awake respiration in normal subjects and patients with sleep disordered breathing. *Am. Rev. Respir. Dis*. **1993**, *148*, 1385–1400, doi:10.1164/ajrccm/148.5.1385.
37. Poole, M.N.; Engel, G.A.; Chaconas, S.J. Nasopharyngeal cephalometrics. *Oral Surg. Oral Med. Oral Pathol*. **1980**, *49*, 266–271, doi:10.1016/0030-4220(80)90059-6.
38. Mandall, N.; Cousley, R.; DiBiase, A.; Dyer, F.; Littlewood, S.; Mattick, R.; Nute, S.J.; Doherty, B.; Stivaros, N.; McDowall, R.; et al. Early class III protraction facemask treatment reduces the need for orthognathic surgery: A multi-centre, two-arm parallel randomized, controlled trial. *J. Orthod*. **2016**, *43*, 164–175, doi:10.1080/14653125.2016.1201302.
39. Ucar, F.I.; Uysal, T. Orofacial airway dimensions in subjects with Class I malocclusion and different growth patterns. *Angle Orthod*. **2011**, *81*, 460–468, doi:10.2319/091910-545.1.
40. Linder-Aronson, S.; Leighton, B.C. A longitudinal study of the development of the posterior nasopharyngeal wall between 3 and 16 years of age. *Eur J. Orthod*. **1983**, *5*, 47–58, doi:10.1093/ejo/5.1.47.
41. Preston, C.; Tobias, P.V.; Salem, O.H. Skeletal age and growth of the nasopharynx in the sagittal plane: a cephalometric study. *Semin. Orthod.* **2004**, *10*, 16–38, doi:10.1053/j.sodo.2003.10.002.
42. Buck, L.M.; Dalci, O.; Darendeliler, M.A.; Papageorgiou, S.N.; Papadopoulou, A.K. Volumetric upper airway changes after rapid maxillary expansion: A systematic review and meta-analysis. *Eur. J. Orthod.* **2016**, *39*, 463–473, doi:10.1093/ejo/cjw048.
43. Almuzian, M.; McConnell, E.; Darendeliler, M.A.; Alharbi, F.; Mohammed, H. The effectiveness of alternating rapid maxillary expansion and constriction combined with maxillary protraction in the treatment of patients with a class III malocclusion: A systematic review and meta-analysis. *J. Orthod.* **2018**, *45*, 250–259, doi:10.1080/14653125.2018.1518187.
44. Zurfluh, M.A.; Kloukos, D.; Patcas, R.; Eliades, T. Effect of chin-cup treatment on the temporomandibular joint: a systematic review. *Eur. J. Orthod.* **2014**, *37*, 314–324, doi:10.1093/ejo/cju048.
45. Rongo, R.; D'Antò, V.; Bucci, R.; Polito, I.; Martina, R.; Michelotti, A. Skeletal and dental effects of Class III orthopaedic treatment: A systematic review and meta-analysis. *J. Oral Rehabil.* **2017**, *44*, 545–562, doi:10.1111/joor.12495.
46. Papageorgiou, S.N.; Cobourne, M.T. Data sharing in orthodontic research. *J. Orthod.* **2018**, *45*, 1–3, doi:10.1080/14653125.2018.1440792.
47. Papageorgiou, S.N.; Xavier, G.M.; Cobourne, M.T. Basic study design influences the results of orthodontic clinical investigations. *J. Clin. Epidemiol.* **2015**, *68*, 1512–1522, doi:10.1016/j.jclinepi.2015.03.008.
48. Papageorgiou, S.N.; Koretsi, V.; Jäger, A. Bias from historical control groups used in orthodontic research: A meta-epidemiological study. *Eur. J. Orthod.* **2016**, *39*, 98–105, doi:10.1093/ejo/cjw035.
49. Cappelleri, J.C.; Loannidis, J.P.A.; Schmid, C.H.; De Ferranti, S.D.; Aubert, M.; Chalmers, T.C.; Lau, J. Large Trials vs. Meta-analysis of Smaller Trials. *JAMA* **1996**, *276*, 1332–1338, doi:10.1001/jama.1996.03540160054033.
50. Aboudara, C.; Nielsen, I.; Huang, J.C.; Maki, K.; Miller, A.J.; Hatcher, D. Comparison of airway space with conventional lateral headfilms and 3-dimensional reconstruction from cone-beam computed tomography. *Am. J. Orthod. Dentofac. Orthop.* **2009**, *135*, 468–479, doi:10.1016/j.ajodo.2007.04.043.

Supplementary Materials

Supplementary Material S1. Additional review details and deviations from the protocol.

Deviations from the protocol
The SMD was decided post hoc to be used post-hoc to pool 4 studies with slightly different cephalometric measurements of total nasopharyngeal area.
Several factors were planned to be assessed through subgroup analyses/meta-regressions in meta-analyses of at least 5 studies, but they could not be ultimately conducted due to limited material/reporting: (i) subsets according to the patient characteristics (patient skeletal age, ethnicity, craniofacial configuration, masticatory activity, etc.), (ii) subsets according to variations of administered treatment and any co-interventions like use of extraoral appliances, skeletal anchorage, full fixed appliances, etc, (iii) subsets according to patient compliance with the treatment.
Robustness of the results was planned a priori to be checked a priori with sensitivity analyses based on (a) inclusion/exclusion of non-randomized studies, (b) inclusion/exclusion of trials with methodological shortcomings, and (c) improvement of the GRADE classification. No such sensitivity analyses could be performed.
Additional methods
Forest plots were augmented with contours denoting effect size for orthopedic treatment, according to the average Standard Deviation (SD) pre-treatment of the untreated control group: ▪ Small (up to half SD) ▪ Moderate (half to one SD) ▪ Large (one to two SDs) ▪ Very large (over two SDs)
The minimal clinically important, large, and very large effects for the GRADE approach were defined as half, one, and two standard deviations of the response of the control (underage) group (Norman et al., 2003).
References
Norman GR, Sloan JA, Wyrwich KW. Interpretation of changes in health-related quality of life: the remarkable universality of half a standarddeviation. Med Care. 2003;41:582–92.

Supplementary Material S2. Eligibility criteria for the inclusion of primary studies.

	Inclusion criteria	**Exclusion criteria**
Patients	Patients of any age, gender, or ethnicity with Class III malocclusion due to a retrusive maxilla, protrusive mandible, or a combination of both scheduled to research orthopedic treatment	Patients with congenital malformations, clefts, any other syndromes, or obstructive sleep apnea
Intervention	Any kind of orthopedic treatment for Class III with facemask / reverse headgear or chin-cup	Any other kind of intervention
Control	Growing patients with skeletal Class III maloclussion without treatment	Untreated patients without Class III malocclusion
Outcome	Airway dimensions	-
Studies	Randomized and prospective / retrospective non-randomized controlled clinical trials	Animal studies, case reports/series, non-clinical studies, and cross-sectional studies

Supplementary Material S3. Literature search (as of August 4th, 2020) for each database with the corresponding hits.

Nr	Database	Search	Limits	
1	MEDLINE (through PubMed)	((("Class III" OR "Cl. III" NOT "Class II" OR ((maxill* OR upper) AND retrognath*) OR ((mandib* OR lower) AND prognath*) OR (anter* AND (crossbite* OR "cross-bite" OR "cross-bites"))) AND (((orthop* OR orthodon* OR functional) AND (treatment* OR therap* OR appliance*)) OR facemask* OR Delaire OR "reverse headgear" OR "reverse Activator" OR chincup OR "chin-cup") AND (airway* OR ((pharyn* OR oropharyn* OR nasopharyn* OR hypopharyn*) AND (volume OR area OR cephalomet*)))))		253
3	CDSR	Same as MEDLINE		1
4	CENTRAL	Same as MEDLINE		34
5	DARE	Same as MEDLINE		0
6	Embase	Same as MEDLINE		120
7	Scopus	(TITLE-ABS-KEY (("Class III" OR "Cl. III" OR ((maxill* OR upper) AND retrognath*) OR ((mandib* OR lower) AND prognath*) OR (anter* AND (crossbite* OR "cross-bite" OR "cross-bites")))) AND TITLE-ABS-KEY ((((orthop* OR orthodon* OR functional) AND (treatment* OR therap* OR appliance*)) OR facemask* OR delaire OR "reverse headgear" OR "reverse Activator" OR chincup OR "chin-cup")) AND TITLE-ABS-KEY ((airway* OR ((pharyn* OR oropharyn* OR nasopharyn* OR hypopharyn*) AND (volume OR area OR cephalomet*)))))	Dentistry	125
8	WOK	Same as MEDLINE	Dentistry, oral surgery, medicine	200
9	VHL	Same as MEDLINE		116
Sum (with overlaps)				849
Sum (without overlaps)				539

CDSR, Cochrane Database of Systematic Reviews; DARE, Cochrane Database of Abstracts of Reviews of Effects; CENTRAL, Cochrane Central Register of Controlled Trials; VHL, virtual health library; WOK, Web of Knowledge.

Supplementary Material S4. List of studies identified from the literature search and their inclusion/exclusion status with reasons.

Nr	Paper	Status
1	[No authors] [Lung transplantation in emphysema]. Medicina (B Aires). 1997;57(5):521-9.	Excluded by title
2	{IRCT138903033915N} Hemodynamic responses to intubation in hypertensive patients. Http://wwwwhoint/trialsearch/trial2aspx? Trialid=irct138903033915n2. 2011.	Excluded by title
3	{IRCT201108167346N} Effect of continuous positive airway pressure in the treatment of refractory hypertension in patients with sever obstructive sleep apnea. Http://wwwwhoint/trialsearch/trial2aspx? Trialid=irct201108167346n1. 2011.	Excluded by title
4	{NCT} Comparison of Treatment Effects of PowerScope2 and Forsus Using CBCT. Https://clinicaltrialsgov/show/nct03296644. 2017.	Excluded by title
5	Abdelrahman TE, Takahashi K, Tamura K, Nakao K, Hassanein KM, Alsuity A, et al. Impact of different surgery modalities to correct class III jaw deformities on the pharyngeal airway space. J Craniofac Surg. 2011;22(5):1598-601.	Excluded by title
6	Abreu MFFd. Análise dos aspectos biomédicos gerais e bucais em pacientes com doença de Alzheimer. 2019. p. 68-.	Excluded by title
7	Acevedo Pérez JL, Sánchez López A, Núñez Núñez C. Logopedia en paciente con mapeo cortical intraoperatorio. Rev logop foniatr audiol (Ed impr). 2017;37(1):43-9.	Excluded by title
8	Adams HR, Defendorf S, Vierhile A, Mink JW, Marshall FJ, Augustine EF. A novel, hybrid, single- and multi-site clinical trial design for CLN3 disease, an ultra-rare lysosomal storage disorder. Clinical trials (London, England). 2019;16(5):555-60.	Excluded by title
9	Adolfo JR, Dhein W, Sbruzzi G. Intensity of physical exercise and its effect on functional capacity in COPD: systematic review and meta-analysis. J bras pneumol. 2019;45(6):e20180011-e.	Excluded by title
10	Akarsu-Guven B, Karakaya J, Ozgur F, Aksu M. Growth-related changes of skeletal and upper-airway features in bilateral cleft lip and palate patients. Am J Orthod Dentofacial Orthop. 2015;148(4):576-86.	Excluded by title
11	Albino CC, Graf H, Paz-Filho G, Diehl LA, Olandoski M, Sabbag A, et al. Radioiodine plus recombinant human thyrotropin do not cause acute airway compression and are effective in reducing multinodular goiter. Braz j med biol res. 2010;43(3):303-9.	Excluded by title
12	Alcalde J, Pastor MJ, Quesada JL, Martín E, García Tapia R. Reconstrucción de defectos orofaríngeos con colgajo lateral de brazo. Acta otorrinolaringol esp. 2001;52(1):39-44.	Excluded by title
13	Al-Dohan AM, Al-Jewair TS. Limited Evidence Suggests That Presurgical Orthodontics May Not Be Needed for Orthognathic Surgery Patients. Journal of Evidence-Based Dental Practice. 2017;17(1):39-41.	Excluded by title
14	Alfwaress F, Al Maaitah E, Al-Khateeb S, Abu Zama Z. The relationship of vocal tract dimensions and substitution of the palatal approximant /j/ for the alveolar trill /r. International Journal of Speech-Language Pathology. 2015;17(5):518-26.	Excluded by title
15	Alkawari HM, Albalbeesi HO, Alhendi AA, Alhuwaish HA, Al Jobair AA, Baidas L. Pharyngeal airway dimensional changes after premolar extraction in skeletal class II and class III orthodontic patients. Journal of Orthodontic Science. 2018;7(1).	Excluded by title
16	Allareddy V, Ching N, Macklin EA, Voelz L, Weintraub G, Davidson E, et al. Craniofacial features as assessed by lateral cephalometric measurements in children with Down syndrome. Prog Orthod. 2016;17(1):35.	Excluded by title
17	Almeida RCC, Artese F, Carvalho FdAR, Cunha RD, Almeida MAdO. Comparação entre a radiografia de cavum e a cefalométrica de perfil na avaliação da nasofaringe e das adenoides por otorrinolaringologistas. Dental press j orthod (Impr). 2011;16(1):e1-e10.	Excluded by title
18	Al-Moraissi EA, Al-Magaleh SM, Iskandar RA, Al-Hendi EA. Impact on the pharyngeal airway space of different orthognathic procedures for the prognathic mandible. Int J Oral Maxillofac Surg. 2015;44(9):1110-8.	Excluded by title
19	Almuzian M, Almukhtar A, Ju X, Al-Hiyali A, Benington P, Ayoub A. Effects of Le Fort I Osteotomy on the Nasopharyngeal Airway-6-Month Follow-Up. J Oral Maxillofac Surg. 2016;74(2):380-91.	Excluded by title
20	Alonso-Rodriguez E, Gomez E, Martin M, Munoz JM, Hernandez-Godoy J, Burgueno M. Beckwith-Wiedemann Syndrome: Open bite evolution after tongue reduction. Med Oral Patol Oral Cir Bucal. 2018;23(2):e225-e9.	Excluded by title
21	Alves RdSA, Vianna FdAF, Pereira CAdC. Fenótipos clínicos de asma grave. J bras pneumol. 2008;34(9):646-53.	Excluded by title
22	Amini F, Borzabadi-Farahani A, Behnam-Roudsari G, Jafari A, Shahidinejad F. Assessment of the uvulo-glossopharyngeal dimensions in patients with beta-thalassemia major. Sleep Breath. 2013;17(3):943-9.	Excluded by title
23	Ancochea J, Gómez García T, Miguel Díez Jd. Hacia un tratamiento individualizado e integrado del paciente con EPOC. Arch bronconeumol (Ed impr). 2010;46(supl.10):14-8.	Excluded by title
24	Andrade CRd, Chatkin JM, Camargos PAM. Avaliação do grau de controle clínico, espirométrico e da intensidade do processo inflamatório na asma. J pediatr (Rio J). 2010;86(2):93-100.	Excluded by title
25	Andrea R, Lopez-Giraldo A, Falces C, Sobradillo P, Sanchis L, Gistau C, et al. Lung function abnormalities are highly frequent in patients with heart failure and preserved ejection fraction. Heart Lung Circ. 2014;23(3):273-9.	Excluded by title
26	Ankichetty S, Chung F. Considerations for patients with obstructive sleep apnea undergoing ambulatory surgery. Current Opinion in Anaesthesiology. 2011;24(6):605-11.	Excluded by title
27	Annoni R, Silva WR, Mariano MdS. Análise de parâmetros funcionais pulmonares e da qualidade de vida na revascularização do miocárdio. Fisioter mov. 2013;26(3):525-36.	Excluded by title
28	Antonia Rodriguez M, Friedberg JP, DiGiovanni A, Binhuan W, Wylie-Rosett J, Sangmin H, et al. A Tailored Behavioral Intervention to Promote Adherence to the DASH Diet. American journal of health behavior. 2019;43(4):659-70.	Excluded by title
29	Araújo CFdSNd, Braga PLdS, Ferreira JDB. Tratamento tardio de fratura condilar: Relato de caso. Rev cir traumatol buco-maxilo-fac. 2013;13(3):17-24.	Excluded by title
30	Athanasiou AE, Toutountzakis N, Mavreas D, Ritzau M, Wenzel A. Alterations of hyoid bone position and pharyngeal depth and their relationship after surgical correction of mandibular prognathism. Am J Orthod Dentofacial Orthop. 1991;100(3):259-65.	Excluded by title
31	Ávila Martínez RJ, Mariscal de Alba A, Zuluaga Bedoya M, Marrón Fernández C, Trujillo MD, Rivas C, et al. Traqueotomías abiertas a pie de cama. Rev patol respir. 2016;19(2):44-7.	Excluded by title
32	Azeredo Bittencourt L, Luz G, Guimaraes T, Silva L, Badke L, Millani A, et al. Effect of treatment of mild obstructive sleep apnea on quality of life, mood and sustained attention: Randomized, parallel, single-blind and controlled study. American Journal of Respiratory and Critical Care Medicine. 2018;197(MeetingAbstracts).	Excluded by title
33	Azevedo KRS. Teste de broncodilatação: a incorporação de novos parâmetros na sua avaliação. Pulmão RJ. 2015;24(1):8-13.	Excluded by title
34	Azevedo MS, Machado AW, Barbosa Ida S, Esteves LS, Rocha VA, Bittencourt MA. Evaluation of upper airways after bimaxillary orthognathic surgery in patients with skeletal Class III pattern using cone-beam computed tomography. Dental Press J Orthod. 2016;21(1):34-41.	Excluded by title
35	Bacher M, Linz A, Buchenau W, Arand J, Krimmel M, Poets C, et al. [Treatment of infants with Pierre Robin sequence]. Laryngorhinootologie. 2010;89(10):621-9.	Excluded by title
36	Baha A, Ekici B, Ogan N, Akpinar EE. A case of sjögren's syndrome-related pulmonary arterial hypertension treated with Iloprost and Bosentan combination therapy. Respiratory Case Reports. 2018;7(2):59-62.	Excluded by title
37	Bartzela TN. Treatment approaches to syndromes affecting craniofacial and dental structures. Journal of the World Federation of Orthodontists. 2019;8(4):131-7.	Excluded by title
38	Bassi E, Miranda LC, Tierno PFGMM, Ferreira CB, Cadamuro FM, Figueiredo VR, et al. Atendimento às vítimas de lesão inalatória por incêndio em ambiente fechado: o que aprendemos com a tragédia de Santa Maria. Rev bras ter intensiva. 2014;26(4):421-9.	Excluded by title
39	Baydur A. Recent developments in the physiological assessment of sarcoidosis: Clinical implications. Current Opinion in Pulmonary Medicine. 2012;18(5):499-505.	Excluded by title
40	Bedhet N, Mercier J, Gordeeff A, Mouzard A, Delaire J. [Labioglossopexy in Pierre Robin syndrome. Our experiences apropos of 70 cases]. Rev Stomatol Chir Maxillofac. 1990;91(5):326-34.	Excluded by title
41	Betancourt-Peña J, Tonguino-Rosero S. Impacto de la oxigenoterapia domiciliaria en la capacidad funcional de pacientes con enfermedad pulmonar obstructiva crónica. Rehabilitación (Madr, Ed impr). 2016;50(1):13-8.	Excluded by title
42	Bisinotto FMB, Seabra BC, Lóes FBP, Martins LB, Silveira LAMd. Postoperative angioedema induced by angiotensin-converting enzyme inhibitor: case report. Rev bras anestesiol. 2019;69(5):521-6.	Excluded by title

43	Bitter N, Roeg D, Van Nieuwenhuizen C, Van Weeghel J. Training professionals in a recovery-oriented methodology: a mixed method evaluation. Scandinavian journal of caring sciences. 2019;33(2):457-66.	Excluded by title
44	Bjorklund KA, Billmire DA. Mandibular Body Resection and Setback for Severe Malocclusion in Lymphatic Malformations. J Craniofac Surg. 2016;27(3):724-6.	Excluded by title
45	Blanco Pérez JJ, Zamarrón Sanz C, Almazán Ortega R, García García M, López Castro J, Tumbeiro Novoa M. Síndrome de apnea del sueño en la insuficiencia cardiaca. Efecto de la presión positiva continua en la vía aérea. An med interna (Madr, 1983). 2008;25(1):15-9.	Excluded by title
46	Borborema dos Santos VD, Assis GMd, Pereira da Silva JS, Rocha Germano A. Glosectomía parcial en paciente portador del síndrome de Beckwith-Wiedemann: relato del caso. Rev esp cir oral maxilofac. 2015;37(4):202-6.	Excluded by title
47	Borborema dos Santos VD, de Assis GM, da Silva JSP, Germano AR. Partial glossectomy in a patient carrier of Beckwith-Wiedemann syndrome: Presentation of a case. Revista Espanola de Cirugia Oral y Maxilofacial. 2015;37(4):202-6.	Excluded by title
48	Brogan WF. The stability of maxillary expansion. Aust Dent J. 1977;22(2):92-9.	Excluded by title
49	Bronfman CN. Avaliação das vias aéreas superiores por meio de tomografia computadorizada Cone-beam em pacientes Classe III submetidos à cirurgia bimaxilar. 2016:104-.	Excluded by title
50	Brunetto DP, Velasco L, Koerich L, Araujo MTD. Prediction of 3-dimensional pharyngeal airway changes after orthognathic surgery: A preliminary study. American Journal of Orthodontics and Dentofacial Orthopedics. 2014;146(3):299-309.	Excluded by title
51	Bruno LP, Motta JPS. Tratamento Endoscópico com Válvulas Endobrônquicas nos Pacientes com Enfisema Pulmonar. Pulmão RJ. 2017;26(1):39-44.	Excluded by title
52	Buchenau W, Wenzel S, Bacher M, Muller-Hagedorn S, Arand J, Poets CF. Functional treatment of airway obstruction and feeding problems in infants with Robin sequence. Arch Dis Child Fetal Neonatal Ed. 2017;102(2):F142-f6.	Excluded by title
53	Burgos MA, Sevilla García MA, Sanmiguel Rojas E, Pino Cd, Fernández Velez C, Piqueras F, et al. Cirugía virtual para pacientes con obstrucción nasal: empleo de un software basado en dinámica de fluidos (MeComLand(R), Digbody(R) & Noseland(R)) para documentar parámetros objetivos de flujo y optimizar resultados quirúrgicos. Acta otorrinolaringol esp. 2018;69(3):125-33.	Excluded by title
54	Bussoni MF, Guirado GN, Matsubara LS, Roscani MG, Polegato BF, Minamoto ST, et al. Diastolic function and functional capacity after a single session of continuous positive airway pressure in patients with compensated heart failure. Clinics. 2014;69(5):354-9.	Excluded by title
55	Butković D. Some pediatric syndromes with difficult airways in anesthesia induction. Acta Medica Croatica. 2018;72:47-56.	Excluded by title
56	C GPd, Saldías P F. Entrenamiento muscular inspiratorio en el paciente con enfermedad pulmonar obstructiva crónica. Rev chil enferm respir. 2011;27(2):116-23.	Excluded by title
57	Cabedo García VR, Rodrigo Garcés Asemany C, Cortes Berti A, Oteo Elso JT, Ballester Salvador JB. Eficacia de la utilización correcta de los dispositivos de inhalación en pacientes con enfermedad pulmonar obstructiva crónica: ensayo clínico aleatorizado. Med clín (Ed impr). 2010;135(13):586-91.	Excluded by title
58	Cabral DMG, Abrahão Júnior LJ, Marques CHD, Pereira BdB, Pedrosa RC. Disfagia orofaríngea na doença de Chagas crônica: avaliação fonoaudiológica, videofluoroscópica e esofagomanométrica. Acta fisiátrica. 2015;22(1).	Excluded by title
59	Cadenat H, Boutault F. Strategy of the Decision in Orthognathic Surgery Part 1. Importance of the Functional Factors for Choosing the Surgical Procedure Theoretical Study. Revue de Stomatologie et de Chirurgie Maxillo-Faciale. 1992;93(1):25-31.	Excluded by title
60	Caillot A, Ambroise B, Benateau H, Veyssiere A. Impact of early intravelar veloplasty at six months on mandibular growth in patients with Pierre Robin Sequence. J Craniomaxillofac Surg. 2018;46(7):1059-64.	Excluded by title
61	Cakirer B, Kucukkeles N, Nevzatoglu S, Koldas T. Sagittal airway changes: rapid palatal expansion versus Le Fort I osteotomy during maxillary protraction. Eur J Orthod. 2012;34(3):381-9.	Excluded by title
62	Calabrese C, Corcione N, Rea G, Stefanelli F, Meoli I, Vatrella A. Impact of long-term treatment with inhaled corticosteroids and bronchodilators on lung function in a patient with post-infectious bronchiolitis obliterans. J bras pneumol. 2016;42(3):228-31.	Excluded by title
63	Call Mañosa S, Pujol Garcia A, Chacón Jordan E, Martí Hereu L, Pérez Tejero G, Gómez Simón V, et al. Plan de cuidados individualizado durante oxigenación con membrana extracorpórea. Caso clinic. Enferm intensiva (Ed impr). 2016;27(2):75-80.	Excluded by title
64	Capan E, Ersu R, Kiyan E, Yener HM, Arman A, Kilicoglu H. Monoblock appliance for treatment of children with sleep disordered breathing. American Journal of Respiratory and Critical Care Medicine. 2015;191.	Excluded by title
65	Capan E, Kiyan E, Ersu R, Kilicoglu H. Monoblock appliance in children with obstructive sleep apnea is an effective treatment modality. European Respiratory Journal. 2014;44.	Excluded by title
66	Caprioglio A, Zucconi M, Calori G, Troiani V. Habitual snoring, OSA and craniofacial modification. Orthodontic clinical and diagnostic aspects in a case control study. Minerva Stomatol. 1999;48(4):125-37.	Excluded by title
67	Carlos-Villafranca Fd, Cobo-Plana J, Macías-Escalada E, Martínez J. Vía aérea difícil: interacciones entre ortodoncia y anestesiología. RCOE, Rev Ilustre Cons Gen Col Odontól Estomatól Esp. 2005;10(2):187-95.	Excluded by title
68	Carra MC, Lavigne G, Rompré P. Sleep bruxismand headache in adolescents. Sleep Medicine. 2011;12:S21.	Excluded by title
69	Casanueva FL, Alzérreca JA. Válvula nasal en rinoplastía. Rev otorrinolaringol cir cabeza cuello. 2017;77(4):441-8.	Excluded by title
70	Castrillo Tambay M, Zubillaga Rodríguez I, Sánchez Aniceto G, Gutiérrez Díaz R, Gutiérrez Díez M, Montalvo Moreno JJ. Distracción osteogénica mandibular en microrretrognatia severa del adulto. Rev esp cir oral maxilofac. 2005;27(4):231-7.	Excluded by title
71	Catalán Escudero P, Uriarte Valiente M, Morató Robert P, Souto Romero H, Olavi IP, Martínez García E. Manejo anestésico para la resección de masa mediastínica anterior (MMA) en paciente pediátrico. Descripción de un caso clínico. Rev esp anestesiol reanim. 2020;67(1):39-43.	Excluded by title
72	Chang HP, Liu PH, Chang HF, Chang CH. Thin-plate spline (TPS) graphical analysis of the mandible on cephalometric radiographs. Dentomaxillofac Radiol. 2002;31(2):137-41.	Excluded by title
73	Chemtob K, Rocchi M, Arbour-Nicitopoulos K, Kairy D, Fillion B, Sweet SN. Using tele-health to enhance motivation, leisure time physical activity, and quality of life in adults with spinal cord injury: a self-determination theory-based pilot randomized control trial. Psychology of sport and exercise. 2019;43:243-52.	Excluded by title
74	Chen F, Terada K, Hanada K, Saito I. Predicting the pharyngeal airway space after mandibular setback surgery. J Oral Maxillofac Surg. 2005;63(10):1509-14.	Excluded by title
75	Chen F, Terada K, Hua Y, Saito I. Effects of bimaxillary surgery and mandibular setback surgery on pharyngeal airway measurements in patients with Class III skeletal deformities. Am J Orthod Dentofacial Orthop. 2007;131(3):372-7.	Excluded by title
76	Chen H, Yagi K, Tsuda H, Almeida F, Lowe A. Klearwa yTM oral appliances for pediatric patients with retruded mandibles. Canadian Respiratory Journal. 2012;19(3):e39.	Excluded by title
77	Chen Q, Zhao Y, Qian Y, Lu C, Shen G, Dai J. A genetic-phenotypic classification for syndromic micrognathia. J Hum Genet. 2019;64(9):875-83.	Excluded by title
78	Choi JW, Park YJ, Lee CY. Posterior Pharyngeal Airway in Clockwise Rotation of Maxillomandibular Complex Using Surgery-first Orthognathic Approach. Plast Reconstr Surg Glob Open. 2015;3(8):e485.	Excluded by title
79	Choi SH, Kang DY, Kim YH, Hwang CJ. Severe skeletal Class III malocclusion treated with 2-stage orthognathic surgery with a mandibular step osteotomy. Am J Orthod Dentofacial Orthop. 2014;145(4 Suppl):S125-35.	Excluded by title
80	Chouard CH. Did Napoleon suffer from chronic rhonchopathy? Acta Oto-Laryngologica. 2017;137(4):361-4.	Excluded by title
81	Cifuentes J, Palisson F, Valladares S, Jerez D. Life-threatening complications following orthognathic surgery in a patient with undiagnosed hereditary angioedema. J Oral Maxillofac Surg. 2013;71(4):e185-8.	Excluded by title
82	Cifuentes J, Valladares S, Barrera A, Jerez D. Life threatening complication posterior to orthognathic surgery in a patient with an undiagnosed hereditary angioedema. International Journal of Oral and Maxillofacial Surgery. 2011;40(10):1196.	Excluded by title
83	Clark HR, Powell AB, Simmons KA, Ayubi T, Kale SD. Endocytic Markers Associated with the Internalization and Processing of Aspergillus fumigatus Conidia by BEAS-2B Cells. mSphere. 2019;4(1).	Excluded by title
84	Cobb ARM, Green B, Gill D, Ayliffe P, Lloyd TW, Bulstrode N, et al. The surgical management of Treacher Collins syndrome. British Journal of Oral and Maxillofacial Surgery. 2014;52(7):581-9.	Excluded by title
85	Cortes M, Gomez M, Park S, Singh D. A combined approach for upper airway remodeling for skeletal class iii malocclusion with complex OSA. Sleep. 2018;41:A206.	Excluded by title
86	Costa Solà R, Muñoz Gall X, Avilés Huertas B, Drobnic Martínez ME, Orriols Martínez R. Síndrome de disfunción reactiva de las vías	Excluded by title

	respiratorias. Estudio de 18 casos. Med clín (Ed impr). 2005;124(11):419-22.	
87	Crisanti AS, Murray-Krezan C, Reno J, Killough C. Effectiveness of Peer-Delivered Trauma Treatment in a Rural Community: a Randomized Non-inferiority Trial. Community mental health journal. 2019;55(7):1125-34.	Excluded by title
88	Cui Y, Moriyama M, Chayama K, Liu Y, Ya C, Muzembo BA, et al. Efficacy of a self-management program in patients with chronic viral hepatitis in China. BMC nursing. 2019;18(1):N.PAG.	Excluded by title
89	Cunha MS, Andrade V, Guedes CAV, Meneghetti CHZ, Aguiar AP, Cardoso AL. Assessment of functional capacity and quality of life in chronic renal patients under hemodialysis treatment. Fisioterapia e pesquisa. 2009;16(2):155-60.	Excluded by title
90	Dahy K, Takahashi K, Saito K, Kiso H, Rezk I, Oga T, et al. Gender differences in morphological and functional outcomes after mandibular setback surgery. J Craniomaxillofac Surg. 2018;46(6):887-92.	Excluded by title
91	Danaei SM, Ajami S, Etemadi H, Azadeh N. Assessment of the effect of maxillary protraction appliance on pharyngeal airway dimensions in relation to changes in tongue posture. Dent Res J (Isfahan). 2018;15(3):208-14.	Excluded by title
92	Davies SF, McQuaid KR, Iber C, McArthur CD, Path MJ, Beebe DS, et al. Extreme dyspnea from unilateral pulmonary venous obstruction. Demonstration of a vagal mechanism and relief by right vagotomy. American Review of Respiratory Disease. 1987;136(1):184-8.	Excluded by title
93	Dawjee SM. A simple appliance for the management of obstructive sleep apnoea--the MEDUNSA Anti-Snoring Device (MASD). Sadj. 2004;59(4):151-3.	Excluded by title
94	de Araújo-Filho AA, de Cerqueira-Neto ML, de Assis Pereira Cacau L, Oliveira GU, Cerqueira TCF, de Santana-Filho VJ. Effect of prophylactic non-invasive mechanical ventilation on functional capacity after heart valve replacement: a clinical trial. Clinics. 2017;72(10):618-23.	Excluded by title
95	de Jong EEC, Sanders KJC, Deist TM, van Elmpt W, Jochems A, van Timmeren JE, et al. Can radiomics help to predict skeletal muscle response to chemotherapy in stage IV non-small cell lung cancer? European journal of cancer. 2019;120:107-13.	Excluded by title
96	Denolf PL, Vanderveken OM, Marklund ME, Braem MJ. The status of cephalometry in the prediction of non-CPAP treatment outcome in obstructive sleep apnea patients. Sleep Med Rev. 2016;27:56-73.	Excluded by title
97	Detsky ME, Jivraj N, Adhikari NK, Friedrich JO, Pinto R, Simel DL, et al. Will This Patient Be Difficult to Intubate? The Rational Clinical Examination Systematic Review. Jama-Journal of the American Medical Association. 2019;321(5):493-503.	Excluded by title
98	DeWood C, Grimes M, Vaden JL. Is the benefit of early orthodontic treatment worth the burden? The Journal of the Tennessee Dental Association. 2006;86(2):12-7.	Excluded by title
99	Do JBA, Bellerive A, Julien A-S, Leclerc JE. Cleft Palates and Occlusal Outcomes in Pierre Robin Sequence. Otolaryngology-Head and Neck Surgery. 2019;160(2):246-54.	Excluded by title
100	D'Onofrio L. Oral dysfunction as a cause of malocclusion. Orthodontics & Craniofacial Research. 2019;22:43-8.	Excluded by title
101	Douglass J, O'Donnell O, Leslie R, Nienstadt L, DiGiorgio MJ. Increasing Patient Accessibility and Use of Hand Sanitizer Through Introduction of a Single-Dose Packet...46th Annual Conference, APIC 2019, Philadelphia, PA. American journal of infection control. 2019;47:S45.	Excluded by title
102	Dubé MP, Chan ES, Lake JE, Williams B, Kinslow J, Landay A, et al. A Randomized, Double-blinded, Placebo-controlled Trial of Sitagliptin for Reducing Inflammation and Immune Activation in Treated and Suppressed Human Immunodeficiency Virus Infection. Clinical infectious diseases. 2019;69(7):1165-72.	Excluded by title
103	Durán-Cantolla J, Cancelo Díaz L, Álvarez Ruiz-Larrinaga A. EPOC y apneas del sueño. Arch bronconeumol (Ed impr). 2010;46(supl.3):2-10.	Excluded by title
104	Echarri Lobiondo P, Pérez Campoy MA, Echarri J. El paciente ortodóncico en dentición mixta y los trastornos del sueño. Rev Ateneo Argent Odontol. 2019;61(2):13-25.	Excluded by title
105	Edwards PD, Rahbar R, Ferraro NF, Burrows PE, Mulliken JB. Lymphatic malformation of the lingual base and oral floor. Plast Reconstr Surg. 2005;115(7):1906-15.	Excluded by title
106	Efendiyeva R, Aydemir H, Karasu H, Toygar-Memikoglu U. Pharyngeal airway space, hyoid bone position, and head posture after bimaxillary orthognathic surgery in Class III patients: long-term evaluation. Angle Orthod. 2014;84(5):773-81.	Excluded by title
107	El Aouame A, Daoui A, El Quars F. Nasal breathing and the vertical dimension: A cephalometric study. Int Orthod. 2016;14(4):491-502.	Excluded by title
108	El-Bialy TH, Razdolsky Y, Kravitz ND, Dessner S, Elgazzar RF. Long-term results of bilateral mandibular distraction osteogenesis using an intraoral tooth-borne device in adult Class II patients. International Journal of Oral and Maxillofacial Surgery. 2013;42(11):1446-53.	Excluded by title
109	Elborn JS. Key advances along the CF pipeline. Pediatric Pulmonology. 2011;46:179-80.	Excluded by title
110	Enacar A, Aksoy AU, Sencift Y, Haydar B, Aras K. Changes in hypopharyngeal airway space and in tongue and hyoid bone positions following the surgical correction of mandibular prognathism. Int J Adult Orthodon Orthognath Surg. 1994;9(4):285-90.	Excluded by title
111	Engel M, Berger M, Hoffmann J, Kuhle R, Ruckschloss T, Ristow O, et al. Midface correction in patients with Crouzon syndrome is Le Fort III distraction osteogenesis with a rigid external distraction device the gold standard? J Craniomaxillofac Surg. 2019;47(3):420-30.	Excluded by title
112	Favaloro RR, Machain A, Gómez C, Perrone SV, Klein F, Presa C, et al. Lung transplantation for emphysema. Medicina. 1997;57(5):521-9.	Excluded by title
113	Fernandes ADO, Sens Y, Xavier VB, Miorin LA, Alves V. Functional and Respiratory Capacity of Patients with Chronic Kidney Disease Undergoing Cycle Ergometer Training during Hemodialysis Sessions: a Randomized Clinical Trial. International journal of nephrology. 2019:1-7.	Excluded by title
114	Fernandes SCdS, Santos RSd, Giovanetti EA, Taniguchi C, Silva CSdM, Eid RAC, et al. Impact of respiratory therapy in vital capacity and functionality of patients undergoing abdominal surgery. Einstein (São Paulo). 2016;14(2):202-7.	Excluded by title
115	Fielbaum C Ó. Avances en fibrosis quística. Rev Méd Clín Condes. 2011;22(2):150-9.	Excluded by title
116	Figueiró-Filho EA, Somensi RS, Queiroz GTd, Maia MZ, Miranda RCF. Ressonância nuclear magnética fetal: aplicabilidade e indicações no período pré-natal. Femina. 2009;37(2):63-9.	Excluded by title
117	Figueroa Casas JC, Schiavi E, Mazzei JA, López AM, Rhodius E, Ciruzzi J, et al. Recomendaciones para la prevención, diagnóstico y tratamiento de LA EPOC en la Argentina. Medicina (BAires). 2012;72(4,supl.1):1-33.	Excluded by title
118	FK93N RBR. A mode of mechanical ventilation applied without artificial airway in the post operative obesity surgery. Http://wwwwhoint/trialsearch/trial2aspx? Trialid=rbr-6fk93n. 2017.	Excluded by title
119	Flanagan D. A dual-laminate snore reduction appliance: a report of four cases. Gen Dent. 2010;58(4):e156-61.	Excluded by title
120	Freng A, Kvam E. Facial sagittal growth following partial, basal resection of the nasal septum: A retrospective study in man. European Journal of Orthodontics. 1979;1(2):89-96.	Excluded by title
121	Gahona O, Argandona J, Pizarro A, Diaz V. Impacto de las prótesis removibles en la posición lingual, patrón de deglución y calibre sagital de la vía aérea orofaríngea. Rev Fac Odontol Univ Antioq. 2013;24(2):243-57.	Excluded by title
122	Gandedkar NH, Chng CK, Por YC, Yeow VKL, Ow ATC, Seah TE. Influence of Bimaxillary Surgery on Pharyngeal Airway in Class III Deformities and Effect on Sleep Apnea: A STOP-BANG Questionnaire and Cone-Beam Computed Tomography Study. J Oral Maxillofac Surg. 2017;75(11):2411-21.	Excluded by title
123	García García S, Carazo Fernández L, García JJ, Naveiro Rilo JC. Enfermedad pulmonar obstructiva crónica: los pacientes en la vida real. Estudio LEONPOC. Aten prim (Barc, Ed impr). 2017;49(10):603-10.	Excluded by title
124	García Menéndez M, Cuspineda Bravo E, Valiente Zaldívar C. Síndrome de apnea hipopnea del sueño: rol protagónico del ortodontista. Rev habanera cienc méd. 2014;13(2):207-18.	Excluded by title
125	Giuca MR, Pasini M, Galli V, Casani AP, Marchetti E, Marzo G. Correlations between transversal discrepancies of the upper maxilla and oral breathing. Eur J Paediatr Dent. 2009;10(1):23-8.	Excluded by title
126	Gogas HJ, Flaherty KT, Dummer R, Ascierto PA, Arance A, Mandala M, et al. Adverse events associated with encorafenib plus binimetinib in the COLUMBUS study: incidence, course and management. European journal of cancer. 2019;119:97-106.	Excluded by title
127	Gokce SM, Gorgulu S, Gokce HS, Bengi AO, Karacayli U, Ors F. Evaluation of pharyngeal airway space changes after bimaxillary orthognathic surgery with a 3-dimensional simulation and modeling program. Am J Orthod Dentofacial Orthop. 2014;146(4):477-92.	Excluded by title
128	Gokce SM, Gorgulu S, Karacayli U, Gokce HS, Battal B. Three-dimensional evaluation of nasal and pharyngeal airway after Le Fort I maxillary distraction osteogenesis. Int J Oral Maxillofac Surg. 2015;44(4):455-61.	Excluded by title
129	Gómez Candela C, Cantón Blanco A, Luengo Pérez LM, Olveira Fuster G. Eficacia, coste-efectividad y efectos sobre la calidad de vida de la suplementación nutricional. Nutr hosp. 2010;25(5):781-92.	Excluded by title
130	Gómez Tejada RA, Enghelmayer JI, Mosquera RP, Cánepa A, Luna C. Bronquiectasias no relacionadas a fibrosis quística en un hospital universitario: Relación entre compromiso funcional y extensión anatómica. Rev am med respir. 2014;14(4):365-74.	Excluded by title

131	Goncalves JR, Buschang PH, Goncalves DG, Wolford LM. Postsurgical stability of oropharyngeal airway changes following counter-clockwise maxillo-mandibular advancement surgery. J Oral Maxillofac Surg. 2006;64(5):755-62.	Excluded by title
132	González Antolín O. Tratamiento local de un faringostoma secundario a osteorradionecrosis. Enferm clín (Ed impr). 2017;27(3):193-202.	Excluded by title
133	González MB, Casellas JB, Fernández Mondragón MP, Nuño VC, Amezaga JA, De Carlos Villafra F. Clinical, esthetic, and quality of life outcomes after telegnathic surgery in Caucasian OSAS patients. Cranio. 2020:1-8.	Excluded by title
134	Gopal R, Tripathi T, Rai P, Kanase A. Three-dimensional assessment of pharyngeal airway space by MRI in class II division 1 patients treated by twin block appliance. Journal of Clinical and Diagnostic Research. 2018;12(9):ZC20-ZC3.	Excluded by title
135	Grippaudo C, Paolantonio EG, Antonini G, Saulle R, La Torre G, Deli R. Association between oral habits, mouth breathing and malocclusion. Acta Otorhinolaryngol Ital. 2016;36(5):386-94.	Excluded by title
136	Guilleminault C, Stoohs R. Obstructive sleep apnea syndrome in children. Pediatrician. 1990;17(1):46-51.	Excluded by title
137	Hajek R, Russell SD, Lyon A, Lenihan D, Moreau P, Joshua D, et al. A substudy of the phase 3 endeavor study: serial echocardiographic assessment of patients with relapsed multiple myeloma (RMM) receiving carfilzomib plus dexamethasone or bortezomib plus dexamethasone. Haematologica. 2016;101:263-.	Excluded by title
138	Halder N, Choudhuri A, Gupta A, Raychowdhury R, Sarkar A, Pal R, et al. Pierre robin sequence (PRS) prenatal diagnostic limitation leading to management challenges after birth. Journal of Perinatal Medicine. 2019;47:eA316.	Excluded by title
139	Hall AB, Ziadi MC, Leech J, Chen SY, Burwash I, Renaud J, et al. Determination of the impact of short term continuous positive airway pressure on myocardial energetics in a randomized study of patients with chronic stable heart failure and obstructive sleep apnea. Circulation. 2011;124(21 Suppl 1):A14320.	Excluded by title
140	Halonen K, Hukki J, Arte S, Hurmerinta K. Craniofacial structures and dental development in three patients with Nager syndrome. Journal of Craniofacial Surgery. 2006;17(6):1180-7.	Excluded by title
141	Hamada T, Ono T, Otsuka R, Honda E, Harada K, Kurabayashi T, et al. Mandibular distraction osteogenesis in a skeletal Class II patient with obstructive sleep apnea. American Journal of Orthodontics and Dentofacial Orthopedics. 2007;131(3):415-25.	Excluded by title
142	Harari D, Redlich M, Miri S, Hamud T, Gross M. The Effect of Mouth Breathing Versus Nasal Breathing on Dentofacial and Craniofacial Development in Orthodontic Patients. Laryngoscope. 2010;120(10):2089-93.	Excluded by title
143	Harris DJ, Wilson MR, Buckingham G, Vine SJ. No effect of transcranial direct current stimulation of frontal, motor or visual cortex on performance of a self-paced visuomotor skill. Psychology of sport and exercise. 2019;43:368-73.	Excluded by title
144	Heliovaara A, Ranta R, Rautio F. Craniofacial cephalometric morphology in six-year-old girls with submucous cleft palate and isolated cleft palate. Acta Odontologica Scandinavica. 2003;61(6):363-6.	Excluded by title
145	Hellquist R, Ponten B. The influence of infant periosteoplasty on facial growth and dental occlusion from five to eight years of age in cases of complete unilateral cleft lip and palate. Scandinavian Journal of Plastic and Reconstructive Surgery. 1979;13(2):305-12.	Excluded by title
146	Hermann NV, Darvann TA, Jensen BL, Dahl E, Bolund S, Kreiborg S. Early craniofacial morphology and growth in children with bilateral complete cleft lip and palate. Cleft Palate-Craniofacial Journal. 2004;41(4):424-38.	Excluded by title
147	Herrejón A, Palop J, Inchaurraga I, López A, Bañuls C, Hernández A, et al. Dosis bajas de acetato de megestrol aumentan el peso y mejoran la nutrición de los pacientes con enfermedad pulmonar obstructiva crónica grave y pérdida de peso. Med clín (Ed impr). 2011;137(5):193-8.	Excluded by title
148	Hetland A, K HH, Olseng M, Gjesdal O, Ross S, Saberniak J, et al. Three months treatment with adaptive servo-ventilation improves cardiac function and physical activity in patients with chronic heart failure and cheyne-stokes respiration in a prospective randomized controlled trial. Circulation. 2011;124(21).	Excluded by title
149	Hevel DJ, Amorose AJ, Lagally KM, Rinaldi-Miles A, Pierce S. Testing the effects of messaging on physical activity motivation in active and non-active adults. Psychology of sport and exercise. 2019;43:333-42.	Excluded by title
150	Hikita R, Kobayashi Y, Tsuji M, Kawamoto T, Moriyamad K. Long-term orthodontic and surgical treatment and stability of a patient with Beckwith-Wiedemann syndrome. American Journal of Orthodontics and Dentofacial Orthopedics. 2014;145(5):672-84.	Excluded by title
151	Hillier SL, Ferrieri P, Edwards MS, Ewell M, Ferris D, Fine P, et al. Phase 2, Randomized, Control Trial of Group B Streptococcus (GBS) Type III Capsular Polysaccharide-tetanus Toxoid (GBS III-TT) Vaccine to Prevent Vaginal Colonization With GBS III. Clinical infectious diseases. 2019;68(12):2079-86.	Excluded by title
152	Hochban W. Surgical treatment of obstructive sleep apnea. Oto-Rhino-Laryngologia Nova. 2000;10(3-4):149-61.	Excluded by title
153	Hoffstein V, Wright S. Improvement in upper airway structure and function in a snoring patient following orthognathic surgery. Journal of Oral and Maxillofacial Surgery. 1991;49(6):656-8.	Excluded by title
154	Hohenberger P, Bonvalot S, van Coevorden F, Rutkowski P, Stoeckle E, Olungu C, et al. Quality of surgery and surgical reporting for patients with primary gastrointestinal stromal tumours participating in the EORTC STBSG 62024 adjuvant imatinib study. European journal of cancer. 2019;120:47-53.	Excluded by title
155	Hsieh YJ, Chen YC, Chen YA, Liao YF, Chen YR. Effect of bimaxillary rotational setback surgery on upper airway structure in skeletal class III deformities. Plast Reconstr Surg. 2015;135(2):361e-9e.	Excluded by title
156	Hueto J, Cebollero P, Pascal I, Cascantea JA, Eguía VM, Teruel F, et al. La espirometría en atención primaria en Navarra. Arch bronconeumol (Ed impr). 2006;42(7):326-31.	Excluded by title
157	Hwang S, Chung CJ, Choi YJ, Huh JK, Kim KH. Changes of hyoid, tongue and pharyngeal airway after mandibular setback surgery by intraoral vertical ramus osteotomy. Angle Orthod. 2010;80(2):302-8.	Excluded by title
158	Hylton JB, Leon-Salazar V, Anderson GC, De Felippe NL. Multidisciplinary treatment approach in Treacher Collins syndrome. J Dent Child (Chic). 2012;79(1):15-21.	Excluded by title
159	Iannetti G, Polimeni A, Pagnoni M, Fadda MT, Ramieri V, Tecco S, et al. Upper airway volume after Le Fort III advancement in subjects with craniofacial malformation. J Craniofac Surg. 2011;22(1):351-5.	Excluded by title
160	Ikavalko T, Narhi M, Eloranta AM, Lintu N, Myllykangas R, Vierola A, et al. Predictors of sleep disordered breathing in children: the PANIC study. Eur J Orthod. 2018;40(3):268-72.	Excluded by title
161	Ike D, Jamami M, Marino DM, Ruas G, Pessoa BV, Lorenzo VAPD. Efeitos do exercício resistido de membros superiores na força muscular periférica e na capacidade funcional do paciente com DPOC. Fisioter mov. 2010;23(3):429-37.	Excluded by title
162	Irani SK, Oliver DR, Movahed R, Kim YI, Thiesen G, Kim KB. Pharyngeal airway evaluation after isolated mandibular setback surgery using cone-beam computed tomography. Am J Orthod Dentofacial Orthop. 2018;153(1):46-53.	Excluded by title
163	Ishida T, Manabe A, Yang SS, Watakabe K, Abe Y, Ono T. An orthodontic-orthognathic patient with obstructive sleep apnea treated with Le Fort I osteotomy advancement and alar cinch suture combined with a muco-musculo-periosteal V-Y closure to minimize nose deformity. Angle Orthod. 2019.	Excluded by title
164	Izquierdo Alonso JL, Rodríguez González-Moro JM, Lucas Ramos Pd, Martín Centeno A, Gobartt Vázquez E. ¿Ha cambiado el manejo de la EPOC en España? Resultados de un estudio multicéntrico comunitario (VICE). Rev clín esp (Ed impr). 2008;208(1):18-25.	Excluded by title
165	Jakobsone G, Stenvik A, Espeland L. The effect of maxillary advancement and impaction on the upper airway after bimaxillary surgery to correct Class III malocclusion. Am J Orthod Dentofacial Orthop. 2011;139(4 Suppl):e369-76.	Excluded by title
166	Janssens J, Weber C, Herrmann F, Cantero C, Pessina A, Matis C, et al. Can Early Introduction of Palliative Care Limit Intensive Care, Emergency and Hospital Admissions in Patients with Severe Chronic Obstructive Pulmonary Disease? A Pilot Randomized Study. Respiration; international review of thoracic diseases. 2019;97(5):406-15.	Excluded by title
167	Jena AK, Singh SP, Utreja AK. Effectiveness of twin-block and Mandibular Protraction Appliance-IV in the improvement of pharyngeal airway passage dimensions in Class II malocclusion subjects with a retrognathic mandible. Angle Orthod. 2013;83(4):728-34.	Excluded by title
168	Jiang C, Yi Y, Jiang C, Fang S, Wang J. Pharyngeal Airway Space and Hyoid Bone Positioning After Different Orthognathic Surgeries in Skeletal Class II Patients. Journal of Oral and Maxillofacial Surgery. 2017;75(7):1482-90.	Excluded by title
169	Jiang YY, Xu X, Su HL, Liu DX. Gender-related difference in the upper airway dimensions and hyoid bone position in Chinese Han children and adolescents aged 6-18 years using cone beam computed tomography. Acta Odontologica Scandinavica. 2015;73(5):391-400.	Excluded by title
170	Jicha GA, Bardach SH, Schmitt FA, Fardo DW, Kryscio RJ, Abner EL, et al. Visual Arts Education improves self-esteem for persons with dementia and reduces caregiver burden: a randomized controlled trial. Dementia (14713012). 2019;18(7/8):3130-42.	Excluded by title

171	Jing T, Zhenghuan S, Qingming B, Pengyi L, Lianbing G. Effects of volume-controlled ventilation vs. pressure-controlled ventilation on respiratory function and inflammatory factors in patients undergoing video-assisted thoracoscopic radical resection of pulmonary carcinoma. Journal of thoracic disease. 2018;10(3):1483-9.	Excluded by title
172	Jun T, Wei H, Xuhui C, Qian L, Tingwei W, Hao J, et al. Liuzijue Qigong: a Voice Training Method For Unilateral Vocal Fold Paralysis Patients. Annals of otology, rhinology, and laryngology. 2019;128(7):654-61.	Excluded by title
173	Jung YW, On SW, Chung KR, Song SI. Simultaneous Glossectomy with Orthognathic Surgery for Mandibular Prognathism. Maxillofac Plast Reconstr Surg. 2014;36(5):214-8.	Excluded by title
174	Kaditis AG, Alvarez MLA, Boudewyns A, Alexopoulos EI, Ersu R, Joosten K, et al. Obstructive sleep disordered breathing in 2- to 18-year-old children: Diagnosis and management. European Respiratory Journal. 2016;47(1):69-94.	Excluded by title
175	Kaklamanos EG, Athanasiou AE. Re: maxillary protraction appliance effect on the size of the upper airway passage. The Angle Orthod. 2008;78(5).	Excluded by title
176	Kalladka M. Dental sleep medicine. Sleep and Vigilance. 2017;1(2):137-8.	Excluded by title
177	Kamano E, Terajima M, Kitahara T, Takahashi I. Three-dimensional analysis of changes in pharyngeal airway space after mandibular setback surgery. Orthodontic Waves. 2017;76(1):1-8.	Excluded by title
178	Kanke K, Abe T, Abe M, Mori Y, Hoshi K, Takato T. In-hospital surgical treatment for haemorrhage after aesthetic mandibular osteotomy performed as an office-based day surgery: A case report. Annals of Medicine and Surgery. 2017;24:15-8.	Excluded by title
179	Kanwal B, Shetty A, Mani V, Prashanth CS, Pramod KM, Arjunan S. Esthetic Outcome and Airway Evaluation following Bi-Jaw Surgery V/S Mandibular Setback Surgery in Skeletal Class III Malocclusion Using Surgery First Approach. Ann Maxillofac Surg. 2018;8(2):270-5.	Excluded by title
180	Kapila SD, Nervina JM. CBCT in orthodontics: assessment of treatment outcomes and indications for its use. Dentomaxillofacial Radiology. 2015;44(1).	Excluded by title
181	Karabekmez FE, Keller EE, Stork JT, Regenitter FJ, Bite U. A long-term clinical and cephalometric study of cleft lip and palate patients following intraoral maxillary quadrangular le fort I osteotomy. Cleft Palate Craniofac J. 2015;52(3):311-26.	Excluded by title
182	Karloh M, Araujo CLP, Gulart AA, Reis CM, Steidle LJM, Mayer AF. The Glittre-ADL test reflects functional performance measured by physical activities of daily living in patients with chronic obstructive pulmonary disease. Braz j phys ther (Impr). 2016;20(3):223-30.	Excluded by title
183	Kasfikis G, Antoniades H, Kyrgidis A, Markovitsi E, Antoniades K. Craniofacial surgical management of a patient with systematic juvenile idiopathic arthritis and Crohn's disease. J Craniofac Surg. 2009;20(3):948-50.	Excluded by title
184	Katsuki T, Miyanoshita Y, Goto M. Long-term results of primary veloplasty for cleft palate. Japanese Journal of Plastic and Reconstructive Surgery. 1979;22(3):163-74.	Excluded by title
185	Kawakami M, Yamamoto K, Noshi T, Miyawaki S, Kirita T. Effect of surgical reduction of the tongue on dentofacial structure following mandibular setback. J Oral Maxillofac Surg. 2004;62(10):1188-92.	Excluded by title
186	Kecik D. Evaluation of Protraction Face-Mask Therapy on the Craniofacial and Upper Airway Morphology in Unilateral Cleft Lip and Palate. J Craniofac Surg. 2017;28(7):e627-e32.	Excluded by title
187	Kim J-E, Yim S, Choi J-Y, Kim S, Kim S-J, Baek S-H. Effects of the long-term use of maxillary protraction facemasks with skeletal anchorage on pharyngeal airway dimensions in growing patients with cleft lip and palate. Korean Journal of Orthodontics. 2020;50(4):238-48.	Excluded by title
188	Kim SJ, Kim YS, Park JH, Kim SW. Cephalometric predictors of therapeutic response to multilevel surgery in patients with obstructive sleep apnea. J Oral Maxillofac Surg. 2012;70(6):1404-12.	Excluded by title
189	Kim YI, Park SB, Kim JR. A study of upper airway dimensional change according to maxillary superior movement after orthognathic surgery. Korean Journal of Orthodontics. 2008;38(2):121-32.	Excluded by title
190	Kirjavainen M, Kirjavainen T. Upper airway dimensions in Class II malocclusion. Effects of headgear treatment. Angle Orthod. 2007;77(6):1046-53.	Excluded by title
191	Kitahara T, Hoshino Y, Maruyama K, In E, Takahashi I. Changes in the pharyngeal airway space and hyoid bone position after mandibular setback surgery for skeletal Class III jaw deformity in Japanese women. Am J Orthod Dentofacial Orthop. 2010;138(6):708.e1-10; discussion -9.	Excluded by title
192	Kochar GD, Chakranarayan A, Kohli S, Kohli VS, Khanna V, Jayan B, et al. Effect of surgical mandibular advancement on pharyngeal airway dimensions: a three-dimensional computed tomography study. International Journal of Oral and Maxillofacial Surgery. 2016;45(5):553-9.	Excluded by title
193	Köhler S, Wilz G, Meichsner F. Moving through predeath grief: psychological support for family caregivers of people with dementia. Dementia (14713012). 2019;18(7/8):2474-93.	Excluded by title
194	Kondo E, Ono M, Aoba TJ. Utilization of third molars in the orthodontic treatment of skeletal class III subjects with severe lateral deviation: case report. World J Orthod. 2004;5(3):201-12.	Excluded by title
195	Kreia TB. A influência do padrão respiratório no crescimento craniofacial. 2011. p. 120-.	Excluded by title
196	Kunjur J, Messiah A, Manisali M. Obstructive sleep apnoea after orthognathic surgery. International Journal of Oral and Maxillofacial Surgery. 2015;44:e250-e1.	Excluded by title
197	Kuramae M, Tavares SW, Almeida HAd, Almeida MHCd, Noüer DF. Correção da deglutição atípica associada à mordida aberta anterior: relato de caso clínico. J bras ortodon ortop facial. 2002;6(36):493-501.	Excluded by title
198	Lages PC. Impacto do uso de simbiótico na evolução de pacientes com neoplasia de vias aéreas e digestivas superiores submetidos a tratamento cirúrgico. 2016. p. 85-.	Excluded by title
199	Lan CC, Hung KF, Liao YF, Lin SW, Chen NH. Melnick-needles syndrome with obstructive sleep apnea successfully treated with nasal continuous positive airway pressure ventilation. Journal of the Formosan Medical Association. 2006;105(1):77-9.	Excluded by title
200	Langeron O, Birenbaum A, Raux M. Airway management in obese patient. Minerva Anestesiologica. 2014;80(3):382-92.	Excluded by title
201	Laraway D, Richardson D, Domingez-Gonzalez S, Duncan C. Changes in overjet and overbite following midface advancement in syndromic craniosynostosis. International Journal of Oral and Maxillofacial Surgery. 2015;44:e96.	Excluded by title
202	Laureano Filho JR, Godoy F, O'Ryan F. Orthodontic bracket lost in the airway during orthognathic surgery. Am J Orthod Dentofacial Orthop. 2008;134(2):288-90.	Excluded by title
203	Laverde-Sábogal CE, Espinosa-Almanza CJ. Fenómeno de flujo, diagnóstico diferencial de la hipoxemia refractaria en pacientes con masa mediastinal anterior. Reporte de caso. Rev colomb anestesiol. 2017;45(supl.1):66-70.	Excluded by title
204	Lee RWW, Sutherland K, Cistulli PA. Craniofacial morphology in obstructive sleep apnea: A review. Clinical Pulmonary Medicine. 2010;17(4):189-95.	Excluded by title
205	Lee UL, Oh H, Min SK, Shin JH, Kang YS, Lee WW, et al. The structural changes of upper airway and newly developed sleep breathing disorders after surgical treatment in class III malocclusion subjects. Medicine (Baltimore). 2017;96(22):e6873.	Excluded by title
206	Lepesqueur LSS. Efeitos da fibrose cística sobre o microbioma bucal e o proteoma salivar. 2019. p. 201-.	Excluded by title
207	Li L, Liu H, Cheng H, Han Y, Wang C, Chen Y, et al. CBCT evaluation of the upper airway morphological changes in growing patients of class II division 1 malocclusion with mandibular retrusion using twin block appliance: a comparative research. PLoS One. 2014;9(4):e94378.	Excluded by title
208	Li S, Wang G, Wang C, Gao X, Jin F, Yang H, et al. The REACH Trial: a Randomized Controlled Trial Assessing the Safety and Effectiveness of the Spiration® Valve System in the Treatment of Severe Emphysema. Respiration; international review of thoracic diseases. 2019;97(5):416-27.	Excluded by title
209	Li YM, Liu JL, Zhao JL, Dai J, Wang L, Chen JW. Morphological changes in the pharyngeal airway of female skeletal class III patients following bimaxillary surgery: a cone beam computed tomography evaluation. Int J Oral Maxillofac Surg. 2014;43(7):862-7.	Excluded by title
210	Linz A, Bacher M, Kagan KO, Buchenau W, Arand J, Poets CF. [Pierre Robin Sequence: interdisciplinary treatment after prenatal diagnosis]. Z Geburtshilfe Neonatol. 2011;215(3):105-8.	Excluded by title
211	Liu Y, Lowe AA, Zeng X, Fu M, Fleetham JA. Cephalometric comparisons between Chinese and Caucasian patients with obstructive sleep apnea. Am J Orthod Dentofacial Orthop. 2000;117(4):479-85.	Excluded by title
212	Liukkonen M, Vahatalo K, Peltomaki T, Tiekso J, Happonen RP. Effect of mandibular setback surgery on the posterior airway size. Int J Adult Orthodon Orthognath Surg. 2002;17(1):41-6.	Excluded by title
213	Locke SR, McKay RC, Jung ME. "I'm just too busy to exercise": reframing the negative thoughts associated with exercise-related cognitive errors. Psychology of sport and exercise. 2019;43:279-87.	Excluded by title
214	Lopes AJ, Mafort TT. Uso da técnica de Washout de Nitrogênio para avaliação do acometimento da pequena via aérea em pacientes com	Excluded by title

	DPOC. Pulmäo RJ. 2017;26(1):51-6.	
215	Lorenz de Sarin G, Ceccarelli AA, Rivas NH, Gastagnet SM, Bartolomé AE. Cefalograma faríngeo: 2da parte. Rev Soc Odontol La Plata. 2001;14(28):19-24.	Excluded by title
216	Luchesi KF, Kitamura S, Mourão LF. Management of dysphagia in Parkinson's disease and amyotrophic lateral sclerosis. CoDAS. 2013;25(4):358-64.	Excluded by title
217	Lukash F, Schwartz M, Korsh J, O'Brien K, Aliano K. Dynamic cleft infant maxillary orthopedics and periosteoplasty: A 25 year study. Cleft Palate-Craniofacial Journal. 2015;52(4):e126-e7.	Excluded by title
218	Ma K, Lu N, Zou F, Meng FZ. Sirtuins as novel targets in the pathogenesis of airway inflammation in bronchial asthma. Eur J Pharmacol. 2019;865:172670.	Excluded by title
219	Maas C, Poets CF. Initial treatment and early weight gain of children with Robin Sequence in Germany: a prospective epidemiological study. Arch Dis Child Fetal Neonatal Ed. 2014;99(6):F491-4.	Excluded by title
220	Machado DC, Camilo GB, Noronha AJ, Montessi OVD, Capone R, Capone D. Diagnóstico radiológico da DPOC. Pulmão RJ. 2013;22(2):45-9.	Excluded by title
221	Macri DT, Ciruffo PAD, Valdrighi HC, Vedovello SAS. Avaliação das alterações morfológicas faciais e dentárias em indivíduos adultos com incompetência labial. RGO (Porto Alegre). 2008;56(2):163-8.	Excluded by title
222	Marchetti C, Bianchi A, Merlini L, Tonelli P. Rigid internal fixation of the jaws in an adult patient with facio-scapulo-humeral muscular dystrophy: report of a case. J Craniomaxillofac Surg. 1997;25(5):275-8.	Excluded by title
223	Maricoto T, Madanelo S, Rodrigues L, Teixeira G, Valente C, Andrade L, et al. Educational interventions to improve inhaler techniques and their impact on asthma and COPD control: a pilot effectiveness-implementation trial. J bras pneumol. 2016;42(6):440-3.	Excluded by title
224	Marsan G, Cura N, Emekli U. Changes in pharyngeal (airway) morphology in Class III Turkish female patients after mandibular setback surgery. J Craniomaxillofac Surg. 2008;36(6):341-5.	Excluded by title
225	Marşan G, Vasfi Kuvat S, Öztaş E, Cura N, Süsal Z, Emekli U. Oropharyngeal airway changes following bimaxillary surgery in Class III female adults. Journal of Cranio-Maxillofacial Surgery. 2009;37(2):69-73.	Excluded by title
226	Martínez F, Pinazzo S, Moragues R, Suarez E. Complicaciones de la cirugía del plexo braquial. Neurocir - Soc Luso-Esp Neurocir. 2015;26(2):73-7.	Excluded by title
227	Martínez González C, González Barcala FJ, Belda Ramírez J, González Ros I, Alfageme Michavila I, Orejas Martínez C, et al. Recomendaciones para la evaluación médica de la capacidad laboral en el enfermo respiratorio crónico. Arch bronconeumol (Ed impr). 2013;49(11):480-90.	Excluded by title
228	Martínez LP. Macroglosia: etiología multifactorial, manejo múltiple: [revisión]. Colomb med. 2006;37(1):67-73.	Excluded by title
229	Martins AB, Tufik S, Moura SMGPT. Síndrome da apnéia-hipopnéia obstrutiva do sono. Fisiopatologia. J bras pneumol. 2007;33(1):93-100.	Excluded by title
230	Martín-Salvador A, Colodro-Amores G, Torres-Sánchez I, Moreno-Ramírez MP, Cabrera-Martos I, Valenza MC. Intervención fisioterápica durante la hospitalización en pacientes con exacerbación aguda de la enfermedad pulmonar obstructiva crónica y neumonía: un ensayo clínico aleatorizado. Med clín (Ed impr). 2016;146(7):301-4.	Excluded by title
231	Martín-Valero R, Cuesta-Vargas AI, Labajos-Manzanares M. Revisión de ensayos clínicos sobre rehabilitación respiratoria en enfermos pulmonares obstructivos crónicos. Rehabilitación (Madr, Ed impr). 2010;44(2):158-66.	Excluded by title
232	Maternal Epidural Steroids to Prevent Neonatal Exposure to Hyperthermia and Inflammation. American journal of perinatology. 2019;36(8):828-34.	Excluded by title
233	Matsumoto H, Kasai T, Hayashi H, Tabuchi H, Sekita G, Tokano T, et al. Cardiac resynchronization therapy altered the severity and pattern of sleep disordered breathing in case of heart failure with systolic dysfunction. Journal of Cardiac Failure. 2017;23(10):S53-S4.	Excluded by title
234	Matsumoto MAN, Romano FL, Ferreira JTL, Valério RA. Open bite: diagnosis, treatment and stability. Braz dent j. 2012;23(6):768-78.	Excluded by title
235	Mattos CT, Vilani GNL, Sant'Anna EF, Ruellas ACO, Maia LC. Effects of orthognathic surgery on oropharyngeal airway: A meta-analysis. International Journal of Oral and Maxillofacial Surgery. 2011;40(12):1347-56.	Excluded by title
236	Mayer G, Meier-Ewert K. Cephalometric predictors for orthopaedic mandibular advancement in obstructive sleep apnoea. Eur J Orthod. 1995;17(1):35-43.	Excluded by title
237	Mayoral Sanz P, Mayoral Herrero P. Repercusiones de la corrección quirúrgicadel prognatismo inferior en la vía aérea. Ortod esp (Ed impr). 2002;42(1):15-21.	Excluded by title
238	McKee JR. Redefining occlusion. Cranio-the Journal of Craniomandibular & Sleep Practice. 2017;35(6):343-4.	Excluded by title
239	Mendes SdL, Filgueiras VM, Ramos TB, Lacerda RHW. Associação entre padrão de crescimento facial e dimensão de orofaringe. Ortho Sci, Orthod sci pract. 2019;45(12):74-80.	Excluded by title
240	Mercuri LG. Papel de la prótesis hecha a medida a medida para la sustitución de la articulación temporomandibular. Rev esp cir oral maxilofac. 2013;35(1):1-10.	Excluded by title
241	Morales Navarro D. Atención inicial al politraumatizado maxilofacial: evaluación de la vía aérea y la circulación. Rev cuba estomatol. 2015;52(3):336-55.	Excluded by title
242	Müller-Hagedorn S, Arand J, Scholz T, Poets CF, Wiechers C. An innovative method for manufacturing the Tuebingen palatal plate for infants with Robin sequence. BMC Pediatr. 2020;20(1):103.	Excluded by title
243	Muto T, Yamazaki A, Takeda S, Sato Y. Accuracy of Predicting the Pharyngeal Airway Space on the Cephalogram After Mandibular Setback Surgery. Journal of Oral and Maxillofacial Surgery. 2008;66(6):1099-103.	Excluded by title
244	Nakagawa F, Ono T, Ishiwata Y, Kuroda T. Morphologic changes in the upper airway structure following surgical correction of mandibular prognathism. Int J Adult Orthodon Orthognath Surg. 1998;13(4):299-306.	Excluded by title
245	Nakajima Y, Nakano H, Sumida T, Yamada T, Inoue K, Sugiyama G, et al. High Le Fort I osteotomy for correction of mid-face deformity in Crouzon syndrome. Congenital Anomalies. 2016;56(5):240-2.	Excluded by title
246	Nakamura M, Yanagita T, Matsumura T, Yamashiro T, Iida S, Kamioka H. A case of severe mandibular retrognathism with bilateral condylar deformities treated with Le Fort I osteotomy and two advancement genioplasty procedures. Korean J Orthod. 2016;46(6):395-408.	Excluded by title
247	Namaki S, Maekawa N, Iwata J, Sawada K, Namaki M, Bjornland T, et al. Long-term evaluation of swallowing function before and after sagittal split ramus osteotomy. Int J Oral Maxillofac Surg. 2014;43(7):856-61.	Excluded by title
248	Ngan PW, Wei SH, Yen PK. Orthodontic treatment of the primary dentition. J Am Dent Assoc. 1988;116(3):336-40.	Excluded by title
249	Nieto Barbero MA. EPOC e hipertensión pulmonar. Arch bronconeumol (Ed impr). 2009;45(supl.4):24-30.	Excluded by title
250	Niskanen I, Kurimo J, Järnstedt J, Himanen SL, Helminen M, Peltomäki T. Effect of Maxillomandibular Advancement Surgery on Pharyngeal Airway Volume and Polysomnography Data in Obstructive Sleep Apnea Patients. J Oral Maxillofac Surg. 2019;77(8):1695-702.	Excluded by title
251	Nojima MCG. An interview with: Mark G. Hans. Dental Press Journal of Orthodontics. 2014;19(3):26-35.	Excluded by title
252	Oldfield V, Lyseng-Williamson KA. Bosentan: A review of its use in pulmonary arterial hypertension and systemic sclerosis. American Journal of Cardiovascular Drugs. 2006;6(3):189-208.	Excluded by title
253	Ortiz-Gómez JR, Palacio-Abizanda F, Fornet-Ruiz I. Failed intubation in pregnancy: Prophylaxis and management. Regional Anesthesia and Pain Medicine. 2011;36(5):E105-E13.	Excluded by title
254	Ow AT, Cheung LK. Meta-analysis of mandibular distraction osteogenesis: clinical applications and functional outcomes. Plast Reconstr Surg. 2008;121(3):54e-69e.	Excluded by title
255	Ozbek MM, Memikoglu TU, Gogen H, Lowe AA, Baspinar E. Oropharyngeal airway dimensions and functional-orthopedic treatment in skeletal Class II cases. Angle Orthod. 1998;68(4):327-36.	Excluded by title
256	Paiva JBdP. Estudo comparativo da geometria nasal e da resistência respiratória em diferentes tipos faciais. 2008. p. 174-.	Excluded by title
257	Palandi J, José P, Schmitt VM, Cechetti F, Saccani R, Bonetti LV. Análise da marcha em pacientes portadores de doença pulmonar obstrutiva crônica antes e após programa de reabilitação pulmonar. Fisioter Bras. 2017;18(4):f: 401-I:8.	Excluded by title
258	Panou E, Motro M, Ates M, Acar A, Erverdi N. Dimensional changes of maxillary sinuses and pharyngeal airway in Class III patients undergoing bimaxillary orthognathic surgery. Angle Orthod. 2013;83(5):824-31.	Excluded by title
259	Papagrigorakis MJ, Karamolegou M, Vilos G, Apostolidis C, Karamesinis K, Synodinos PN. Auriculo-condylar syndrome. Angle Orthod. 2012;82(3):556-64.	Excluded by title

260	Papagrigorakis MJ, Karamolegou M, Vilos G, Apostolidis C, Karamesinis K, Synodinos PN. Auriculo-condylar syndrome: Diagnosis, treatment, and family history of a patient. Angle Orthodontist. 2012;82(3):556-64.	Excluded by title
261	Paramaswamy R. Anesthesia for elective bilateral sagittal slip osteotomy of the mandible and genioplasty in a young man with Klippel-Feil syndrome, Sprengel deformity, and mandibular prognathism. J Dent Anesth Pain Med. 2019;19(5):307-12.	Excluded by title
262	Pascual-Guardia S, Wodja E, Gorostiza A, López de Santamaría E, Gea J, Gáldiz JB, et al. Mejoría de la calidad de vida y capacidad de ejercicio sin cambios en la biología muscular tras entrenamiento general en pacientes con enfermedad pulmonar obstructiva crónica grave. Med clín (Ed impr). 2013;140(5):200-6.	Excluded by title
263	Pastor Vera T. Relación entre respiración oral y deglución atípica: estudio piloto de niños que presentan la característica común de lengua baja. Rev logop foniatr audiol (Ed impr). 2005;25(3):121-7.	Excluded by title
264	Pedersen C, Halvari H, Solstad BE, Bentzen M. Longitudinal trajectories of physical activity among employees participating in a worksite health promotion intervention: a latent class growth approach. Psychology of sport and exercise. 2019;43:311-20.	Excluded by title
265	Peleg AY, Choo JM, Langan KM, Edgeworth D, Keating D, Wilson J, et al. Antibiotic exposure and interpersonal variance mask the effect of ivacaftor on respiratory microbiota composition. Journal of cystic fibrosis. 2018;17(1):50-6.	Excluded by title
266	Pelegrino NRG, Lucheta PA, Sanchez FF, Faganello MM, Ferrari R, Godoy Id. Influência da massa magra corporal nas repercussões cardiopulmonares durante o teste de caminhada de seis minutos em pacientes com DPOC. J bras pneumol. 2009;35(1):20-6.	Excluded by title
267	Pereira SRA, Weckx LLM, Ortolani CLF, Bakor SF. Estudo das alterações craniofaciais e da importância da expansão rápida da maxila após adenotonsilectomia. Braz j otorhinolaryngol (Impr). 2012;78(2):111-7.	Excluded by title
268	Pinto RMdC. Caracterização clínica e inflamatória de pacientes portadores de asma grave controlada e não controlada e resposta ao acompanhamento sistemático e tratamento padronizado. 2010. p. [215]-[].	Excluded by title
269	Pitta F, Troosters T, Probst VS, Lucas S, Decramer M, Gosselink R. Possíveis conseqüências de não se atingir a mínima atividade física diária recomendada em pacientes com doença pulmonar obstrutiva cronica estável. J bras pneumol. 2006;32(4):301-8.	Excluded by title
270	Possa SS. Tratamento com inibidor da Rho quinase em cobaias com inflamação alérgica crônica: modulação da inflamação eosinofílica, da expressão de citocinas inflamatórias, da matriz extracelular, do estresse oxidativo e da reatividade de vias aéreas. 2012. p. 159-.	Excluded by title
271	Prabhakar AR, Rai KK, Bedi S. Management of congenital bilateral temporomandibular joint ankylosis with secondary mandibular hypoplasia. J Pediatr Surg. 2008;43(10):e27-30.	Excluded by title
272	Pradel W, Lauer G, Dinger J, Eckelt U. Mandibular traction--an alternative treatment in infants with Pierre Robin sequence. J Oral Maxillofac Surg. 2009;67(10):2232-7.	Excluded by title
273	Puente-Maestu L, Villar F. Implicaciones de la calidad de vida en las decisiones quirúrgicas del cáncer de pulmón. Psicooncología (Pozuelo de Alarcón). 2006;3(2/3):393-406.	Excluded by title
274	Raboso E, Navas C, Martínez Vidal A, Vázquez R. Hamartoma fibroglandular de fosa nasal: descripción de un caso y revisión. Acta otorrinolaringol esp. 2000;51(5):445-7.	Excluded by title
275	Rachmiel A, Emodi O, Rachmiel D, Aizenbud D. Internal mandibular distraction to relieve airway obstruction in children with severe micrognathia. International Journal of Oral and Maxillofacial Surgery. 2014;43(10):1176-81.	Excluded by title
276	Radescu OD, Colosi HA, Albu S. Effects of rapid palatal expansion (RPE) and twin block mandibular advancement device (MAD) on pharyngeal structures in Class II pediatric patients from Cluj-Napoca, Romania. Cranio. 2018:1-8.	Excluded by title
277	Raskin S, Gilon Y, Limme M. [Cephalometric assessment in obstructive sleep apnea and hypopnea syndrome]. Rev Stomatol Chir Maxillofac. 2002;103(3):158-63.	Excluded by title
278	Ratjen F. Therapies from infancy: Challenges and outcomes. Pediatric Pulmonology. 2019;54:80-1.	Excluded by title
279	Raveli TB, Raveli DB, Dib LPS, Pinto PRdS. Mordida cruzada posterior e suas possibilidades de tratamento. Ortho Sci, Orthod sci pract. 2011;4(15):701-7.	Excluded by title
280	Regiane Resquetia V, Gorostiza A, Gáldiza JB, López de Santa María E, Casan Clarà P, Güell Rous R. Beneficios de un programa de rehabilitación respiratoria domiciliaria en pacientes con EPOC grave. Arch bronconeumol (Ed impr). 2007;43(11):599-604.	Excluded by title
281	Reis HV, Borghi-Silva A, Catai AM, Reis MS. Impact of CPAP on physical exercise tolerance and sympathetic-vagal balance in patients with chronic heart failure. Braz j phys ther (Impr). 2014;18(3):218-27.	Excluded by title
282	Ren YF, Isberg A, Henningsson G. The Influence of Pharyngeal Flap on Facial Growth - Long-Term Results in the Patients with Isolated Cleft-Palate. Scandinavian Journal of Plastic and Reconstructive Surgery and Hand Surgery. 1994;28(1):63-8.	Excluded by title
283	Ren YF, Isberg A, Henningsson G. The influence of pharyngeal flap on facial growth. Long term results in the patients with isolated cleft palate. Scandinavian Journal of Plastic and Reconstructive Surgery and Hand Surgery. 1994;28(1):63-8.	Excluded by title
284	Restrepo C, Santamaria A, Pelaez S, Tapias A. Oropharyngeal airway dimensions after treatment with functional appliances in class II retrognathic children. J Oral Rehabil. 2011;38(8):588-94.	Excluded by title
285	Reynders B, Vansteenkiste M, Van Puyenbroeck S, Aelterman N, De Backer M, Delrue J, et al. Coaching the coach: intervention effects on need-supportive coaching behavior and athlete motivation and engagement. Psychology of sport and exercise. 2019;43:288-300.	Excluded by title
286	Reznikov N, Dagdeviren D, Tamimi F, Glorieux F, Rauch F, Retrouvey JM. Cone-Beam Computed Tomography of Osteogenesis Imperfecta Types III and IV: Three-Dimensional Evaluation of Craniofacial Features and Upper Airways. JBMR Plus. 2019.	Excluded by title
287	Reznikov N, Dagdeviren D, Tamimi F, Glorieux F, Rauch F, Retrouvey JM. Cone-beam computed tomography of osteogenesis imperfecta types III and IV: Three-dimensional evaluation of craniofacial features and upper airways. Journal of Bone and Mineral Research. 2018;33:421.	Excluded by title
288	Ribeiro CdO, Bittencourt MAV, Brandão Filho RA. Avaliação dos efeitos da cirurgia ortognática de recuo mandibular isolado e combinado no tamanho da orofaringe. Ortho Sci, Orthod sci pract. 2011;3(13):414-7.	Excluded by title
289	Robson M, Ruddy KJ, Im S, Senkus E, Xu B, Domchek SM, et al. Patient-reported outcomes in patients with a germline BRCA mutation and HER2-negative metastatic breast cancer receiving olaparib versus chemotherapy in the OlympiAD trial. European journal of cancer. 2019;120:20-30.	Excluded by title
290	Rodrigues DB, Wolford LM, Figueiredo LMG, Adams GQ. Management of ankylosed maxillary canine with single-tooth osteotomy in conjunction with orthognathic surgery. Journal of Oral and Maxillofacial Surgery. 2014;72(12):2419.e1-.e6.	Excluded by title
291	Romanski PA, Farland LV, Tsen LC, Ginsburg ES, Lewis EI. Effect of class III and class IV obesity on oocyte retrieval complications and outcomes. Fertil Steril. 2019;111(2):294-301.e1.	Excluded by title
292	Rondeau BHM. Importance of diagnosing and treating orthodontic and orthopedic problems in children. The Functional orthodontist. 2004;21(3):passim-4, 6, 8 passim.	Excluded by title
293	Rubio-Correa I, Manzano Solo de Zaldívar D, Moreno Sánchez M, Ruíz Laza L, González Ballester D, Monje-Gil F. Melanoma mucoso en una localización extremadamente infrecuente: la base de lengua. A propósito de un caso y revisión de la literatura. Rev esp cir oral maxilofac. 2015;37(2):99-102.	Excluded by title
294	Ruiz-Laiglesia FJ, Garcés-Horna V, Formiga F. Abordaje terapéutico integral del paciente con insuficiencia cardiaca y comorbilidad. Rev clín esp (Ed impr). 2016;216(6):323-30.	Excluded by title
295	Russell SD, Lyon A, Lenihan DJ, Moreau P, Joshua D, Chng WJ, et al. Serial echocardiographic assessment of patients (PTS) with relapsed multiple myeloma (RMM) receiving carfilzomib and dexamethasone (KD) vs bortezomib and dexamethasone (VD): a substudy of the phase 3 endeavor trial (NCT01568866). Blood. 2015;126(23):4250.	Excluded by title
296	Saitoh K. Long-term changes in pharyngeal airway morphology after mandibular setback surgery. Am J Orthod Dentofacial Orthop. 2004;125(5):556-61.	Excluded by title
297	Salisbury Devicenzi JP, Grignola JC, Pascal Acuña G, Domingo E, Parma G, Trujillo Lezama P, et al. Hipertensión pulmonar en la EPOC: puesta al día. Rev urug cardiol. 2013;28(2):162-76.	Excluded by title
298	Sansone D, Flores C, Pérez C, Hanna J. Tratamiento farmacológico para el control de la crisis aguda de asma. Arch venez pueric pediatr. 2010;73(3):33-7.	Excluded by title
299	Santos LM, Ramos B, Almeida J, Loureiro CC, Cordeiro CR. The impact of weight loss beyond lung function: benefit with respect to asthma outcomes. Pulmonology. 2019;25(6):313-9.	Excluded by title
300	Sarı R, Akbaba S, Gündoğdu RH, Yazıcıoğlu M. Comparison of V-Y Flap and Limberg Flap Methods in Pilonidal Sinus Surgery. Turkish journal	Excluded by title

	of colorectal disease. 2019;29(2):69-74.	
301	Schutz TC, Dominguez GC, Hallinan MP, Cunha TC, Tufik S. Class II correction improves nocturnal breathing in adolescents. Angle Orthod. 2011;81(2):222-8.	Excluded by title
302	Seeberger R, Gander E, Hoffmann J, Engel M. Surgical management of cross-bites in orthognathic surgery: Surgically assisted rapid maxillary expansion (SARME) versus two-piece maxilla. Journal of Cranio-Maxillofacial Surgery. 2015;43(7):1109-12.	Excluded by title
303	Severiche-Bueno DF, Severiche-Hernández D, Severiche-Bueno DF, Vargas MT. Síndrome de Mounier Kuhn en una paciente de 78 años con fibrosis pulmonar. Acta méd colomb. 2017;42(3):198-201.	Excluded by title
304	Shaeran TAT, Samsudin AR. Temporomandibular Joint Ankylosis Leading to Obstructive Sleep Apnea. J Craniofac Surg. 2019;30(8):e714-e7.	Excluded by title
305	Shah DH, Kim KB, McQuilling MW, Movahed R, Shah AH, Kim YI. Computational fluid dynamics for the assessment of upper airway changes in skeletal Class III patients treated with mandibular setback surgery. Angle Orthod. 2016;86(6):976-82.	Excluded by title
306	Shang H, Xue Y, Liu Y, Zhao J, He L. Modified internal mandibular distraction osteogenesis in the treatment of micrognathia secondary to temporomandibular joint ankylosis: 4-year follow-up of a case. J Craniomaxillofac Surg. 2012;40(4):373-8.	Excluded by title
307	Sidani S, Epstein DR, Fox M, Collins L. Comparing the Effects of Single- and Multiple-Component Therapies for Insomnia on Sleep Outcomes. Worldviews on evidence-based nursing / Sigma Theta Tau International, Honor Society of Nursing. 2019;16(3):195-203.	Excluded by title
308	Silva CRS, Andrade LB, Maux D, Bezerra AL, Duarte M. Effectiveness of prophylactic non-invasive ventilation on respiratory function in the postoperative phase of pediatric cardiac surgery: a randomized controlled trial. Brazilian journal of physical therapy / revista brasileira de fisioterapia. 2016;20(6):494-501.	Excluded by title
309	Silva FBNN, Cavalieri-Pereira L, Cerezetti LR, Cavalieri-Pereira S, Pedroso-Oliveira G, Rocha JLS, et al. Treatment of tmj ankylosis with alloplastic reconstruction associated with virtually planned orthognathic surgery: case report. International Journal of Oral and Maxillofacial Surgery. 2019;48:283.	Excluded by title
310	Silva KR, Marrara KT, Marino DM, Di Lorenzo VAP, Jamami M. Fraqueza muscular esquelética e intolerância ao exercício em pacientes com doença pulmonar obstrutiva crônica. Braz j phys ther (Impr). 2008;12(3):169-75.	Excluded by title
311	Silva LKd, Brasolotto AG, Berretin-Felix G. Função respiratória em indivíduos com deformidades dentofaciais. Rev CEFAC. 2015;17(3):854-63.	Excluded by title
312	Silva PRDd, Silva PPDd, Dias LPT, Domaneschi C, Uvo SAB. Tratamento cirúrgico para apnéia obstrutiva do sono. Ortodontia. 2010;43(1):63-8.	Excluded by title
313	Sing CY, Lee PHT, Leung ABK, Chung KSM, Kwok JKL, Ho RTH, et al. Managing behavioral and psychological symptoms in Chinese elderly with dementia via group-based music intervention: a cluster randomized controlled trial. Dementia (14713012). 2019;18(7/8):2785-98.	Excluded by title
314	Singla S, Utreja A, Singh SP, Lou W, Suri S. Increase in Sagittal Depth of the Bony Nasopharynx Following Maxillary Protraction in Patients With Unilateral Cleft Lip and Palate. Cleft Palate-Craniofacial Journal. 2014;51(5):585-92.	Excluded by title
315	Skilton M, Krishan A, Patel S, Sinha IP, Southern KW. Potentiators (specific therapies for class III and IV mutations) for cystic fibrosis. Cochrane Database of Systematic Reviews. 2019(1).	Excluded by title
316	Smailienė D, Intienė A, Dobradziejutė I, Kušleika G. Effect of treatment with twin-block appliances on body posture in class ii malocclusion subjects: A prospective clinical study. Medical Science Monitor. 2017;23:343-52.	Excluded by title
317	Snatos Junior JFd, Aidar LAdA, Dominguez-Rodriguez GC, Novikoff S, Abrahão M. Avaliação do espaço aéreo faríngeo em pacientes com retrognatismo mandibular tratados com aparelho Herbst. Ortodontia. 2004;37(3):8-13.	Excluded by title
318	Soares MRPS, Paula FOd, Chaves MdGAM, Assis NMdSP, Chaves Filho HDdM. Patient with Down syndrome and implant therapy: a case report. Braz dent j. 2010;21(6):550-4.	Excluded by title
319	Soni J, Shyagali TR, Bhayya DP, Shah R. Evaluation of Pharyngeal Space in Different Combinations of Class II Skeletal Malocclusion. Acta Inform Med. 2015;23(5):285-9.	Excluded by title
320	Souza R, Kairalla RA, Santos UdP, Takagaki TY, Capelozzi VL, Carvalho CRR. Diffuse panbronchiolitis: an underdiagnosed disease? Study of 4 cases in Brazil. Rev Hosp Clin Fac Med Univ São Paulo. 2002;57(4):167-74.	Excluded by title
321	Soydan SS, Bayram B, Akdeniz BS, Kayhan Z, Uckan S. Changes in difficult airway predictors following mandibular setback surgery. Int J Oral Maxillofac Surg. 2015;44(11):1351-4.	Excluded by title
322	Stanton DC. Genioplasty. Facial Plastic Surgery. 2003;19(1):75-86.	Excluded by title
323	Stelnicki EJ, Boyd JB, Nott RL, Barnavon Y, Uecker C, Henson T. Early treatment of severe mandibular hypoplasia with distraction mesenchymogenesis and bilateral free fibula flaps. J Craniofac Surg. 2001;12(4):337-48.	Excluded by title
324	Suri S, Ross RB, Tompson BD. Craniofacial morphology and adolescent facial growth in Pierre Robin sequence. American Journal of Orthodontics and Dentofacial Orthopedics. 2010;137(6):763-74.	Excluded by title
325	Tan SK, Leung WK, Tang ATH, Zwahlen RA. Effects of mandibular setback with or without maxillary advancement osteotomies on pharyngeal airways: An overview of systematic reviews. PLoS One. 2017;12(10):e0185951.	Excluded by title
326	Tangugsorn V, Krogstad O, Espeland L, Lyberg T. Obstructive sleep apnea (OSA): a cephalometric analysis of severe and non-severe OSA patients. Part I: Multiple comparison of cephalometric variables. Int J Adult Orthodon Orthognath Surg. 2000;15(2):139-52.	Excluded by title
327	Temani P, Jain P, Rathee P, Temani R. Volumetric changes in pharyngeal airway in Class II division 1 patients treated with Forsus-fixed functional appliance: A three-dimensional cone-beam computed tomography study. Contemp Clin Dent. 2016;7(1):31-5.	Excluded by title
328	Terakado K, Shiina Y, Naruse T, Sueishi K, Suzuki T, Yamaguchi H, et al. Effects of surgical orthodontic treatment on oral cavity, tongue, and pharyngeal airway: Part 1: Changes caused by mandibular setback surgery. Shikwa Gakuho. 1997;97(2):181-91.	Excluded by title
329	The Impact of Aspirin on Ultrasound Markers of Uteroplacental Flow in Low-Risk Pregnancy: secondary Analysis of a Multicenter RCT. American journal of perinatology. 2019;36(8):855-63.	Excluded by title
330	Theodore N, Aarabi B, Dhall SS, Gelb DE, Hurlbert RJ, Rozzelle CJ, et al. Transportation of patients with acute traumatic cervical spine injuries. Neurosurgery. 2013;72(SUPPL.2):35-9.	Excluded by title
331	Thofehrn C, Coutinho MSSdA, Daros CB, Assis AVd, Lima RMd, Bonin CDB, et al. Efeitos da aplicação da EPAP (Expiratory Positive Airway Pressure) sobre a tolerância ao esforço em pacientes portadores de insuficiência cardíaca. Rev bras med esporte. 2013;19(2):87-90.	Excluded by title
332	Turner MJ, Luo Y, Thomas DY, Hanrahan JW. The dual phosphodiesterase 3/4 inhibitor RPL554 stimulates rare class III and IV CFTR mutants. Am J Physiol Lung Cell Mol Physiol. 2020;318(5):L908-l20.	Excluded by title
333	Ulusoy C, Canigur Bavbek N, Tuncer BB, Tuncer C, Turkoz C, Gencturk Z. Evaluation of airway dimensions and changes in hyoid bone position following class II functional therapy with activator. Acta Odontol Scand. 2014;72(8):917-25.	Excluded by title
334	Uozumi T, Yoshikawa Y, Yokoi Y, Ando N, Taguchi A, Ogasawara T, et al. A comparative study on the morphological changes in the pharyngeal airway space before and after sagittal split ramus osteotomy. Journal of Hard Tissue Biology. 2012;21(1):35-42.	Excluded by title
335	Valero A, Navarro AM, Cuvillo Ad, Alobid I, Benito JR, Colás C, et al. Position paper on nasal obstruction: evaluation and treatment. J investig allergol clin immunol. 2018;28(2):67-90.	Excluded by title
336	Vanderveken O, Vos W, De Backer J, Wouters K, De Backer W, Dieltjens M, et al. Functional respiratory imaging to evaluate treatment effect of fixed mandibular advancement in OSA patients. Sleep. 2015;38:A195.	Excluded by title
337	Vanderveken OM, Vos W, De Backer J, Wouters K, De Backer W, Dieltjens M, et al. The role of functional respiratory imaging (FRI) in the prediction of treatment outcome with fixed mandibular advancement in OSA patients. American Journal of Respiratory and Critical Care Medicine. 2015;191.	Excluded by title
338	Vatlach S, Maas C, Poets CF. Birth prevalence and initial treatment of Robin sequence in Germany: a prospective epidemiologic study. Orphanet J Rare Dis. 2014;9:9.	Excluded by title
339	Veronezi J, Carvalho AP, Ricachinewsky C, Hoffmann A, Kobayashi DY, Piltcher OB, et al. Sleep-disordered breathing in patients with cystic fibrosis. J bras pneumol. 2015;41(4):351-7.	Excluded by title
340	Vicente González E, Adiego Leza I, Maltrana García JA, Aznar Facerías E, Ortiz García A. Fisiopatología de los trastornos respiratorios del sueño en los niños. Acta otorrinolaringol esp. 2010;61(supl.1):14-21.	Excluded by title
341	Vijay P, Pardhe N, Sunil VSB, Bajpai M, Chhibber N. Unilateral ankylosis of temporomandibular joint (TMJ) with contralateral condylar aplasia and related orthopedic deformity – syndromic or nonsyndromic? Journal of Clinical and Diagnostic Research. 2015;9(1):34-6.	Excluded by title
342	Vinereanu A, Bratu AM, Munteanu A, Teodorescu E, Tusaliu M. Craniofacial Dynamics and Treatment-Induced Functional Changes in a Case of Ectodermal Dysplasia. Romanian Journal of Oral Rehabilitation. 2018;10(1):14-9.	Excluded by title

343	Vinoth SK, Thomas AV, Nethravathy R. Cephalomteric changes in airway dimensions with twin block therapy in growing Class II patients. Journal of Pharmacy and Bioallied Sciences. 2013;5(SUPPL.1):S25-S9.	Excluded by title
344	Vinuesa D, Ramos V, Peña A, Ruiz-Ruigómez M, Badiola J, Muñoz-Medina L, et al. Nebulized medication is not associated with nosocomial infections. A pilot study. Rev esp quimioter. 2015;28(3):154-6.	Excluded by title
345	Vos W, Vanderveken O, De Backer J, Wouters K, De Backer W, Dieltjens M, et al. Functional respiratory imaging to prediction treatment outcome of fixed mandibular advancement in OSA patients. Sleep. 2015;38:A195.	Excluded by title
346	Vos W, Vanderveken OM, De Backer J, Wouters K, De Backer W, Dieltjens M, et al. The role of functional respiratory imaging in the prediction of treatment outcome with fixed mandibular advancement in OSA patients. American Journal of Respiratory and Critical Care Medicine. 2015;191.	Excluded by title
347	Wang H, Qi S, Wang J, Cai Z, Li C. [Detection to changes in hyoid and tongue positions, and pharyngeal airway following mandibular setback surgery by cone beam CT]. Hua Xi Kou Qiang Yi Xue Za Zhi. 2012;30(6):650-4.	Excluded by title
348	Wang H, Qi S, Yan M, Zhang C, Ren S, Zhang J. [Cone-beam computed tomography evaluation of upper airway change in skeletal Class III patients after orthodontic-mandibular setback surgery]. Zhonghua Kou Qiang Yi Xue Za Zhi. 2015;50(10):615-8.	Excluded by title
349	Wang HW, Li LY, Qi SQ, Yan M. [Cone-beam computed tomography evaluation of short- and long-term airway changes in patients with skeletal Class malocclusion treated by orthodontic therapy and bimaxillary surgery with or without mandibular setback surgery]. Shanghai Kou Qiang Yi Xue. 2016;25(4):487-91.	Excluded by title
350	Wang HW, Wang JG, Qi SQ, Cai ZF, Li XH. [Three-dimensional analysis of pharyngeal airway in skeletal Class III patients after sagittal split ramus osteotomy]. Zhonghua Kou Qiang Yi Xue Za Zhi. 2012;47(4):221-4.	Excluded by title
351	Wenzel A, Williams S, Ritzau M. Relationships of changes in craniofacial morphology, head posture, and nasopharyngeal airway size following mandibular osteotomy. Am J Orthod Dentofacial Orthop. 1989;96(2):138-43.	Excluded by title
352	Werneck LC, Scola RH, Germiniani FMB, Comerlato EA, Cunha FMB. Myasthenic crisis: report of 24 cases. Arq neuropsiquiatr. 2002;60(3A):519-24.	Excluded by title
353	Wiechers C, Buchenau W, Arand J, Oertel A-F, Peters K, Mueller-Hagedorn S, et al. Mandibular growth in infants with Robin sequence treated with the Tubingen palatal plate. Head & Face Medicine. 2019;15.	Excluded by title
354	Wiechers C, Buchenau W, Arand J, Oertel AF, Peters K, Müller-Hagedorn S, et al. Mandibular growth in infants with Robin sequence treated with the Tübingen palatal plate. Head Face Med. 2019;15(1):17.	Excluded by title
355	Wolford LM, Cassano DS, Cottrell DA, El Deeb M, Karras SC, Goncalves JR. Orthognathic surgery in the young cleft patient: preliminary study on subsequent facial growth. J Oral Maxillofac Surg. 2008;66(12):2524-36.	Excluded by title
356	Xiang M, Hu B, Liu Y, Sun J, Song J. Changes in airway dimensions following functional appliances in growing patients with skeletal class II malocclusion: A systematic review and meta-analysis. Int J Pediatr Otorhinolaryngol. 2017;97:170-80.	Excluded by title
357	Xu HS, Mu XZ, Yu ZY, Feng SZ, Han JY, Zhang DS. [Experience of midfacial distraction osteogenesis in upper airway stenosis]. Zhonghua Wai Ke Za Zhi. 2008;46(8):577-80.	Excluded by title
358	Yajima Y, Oshima M, Iwai T, Kitajima H, Omura S, Tohnai I. Computational fluid dynamics study of the pharyngeal airway space before and after mandibular setback surgery in patients with mandibular prognathism. Int J Oral Maxillofac Surg. 2017;46(7):839-44.	Excluded by title
359	Yilmaz BS, Kucukkeles N. Skeletal, soft tissue, and airway changes following the alternate maxillary expansions and constrictions protocol. Angle Orthod. 2014;84(5):868-77.	Excluded by title
360	Zanelato ACT, Kochenborger R, Miranda ALRd, Bommarito S, Scanavini MA. Descrição de um método para determinação do espaço aéreo naso e bucofaríngeo. Ortho Sci, Orthod sci pract. 2009;2(7/8):672-8.	Excluded by title
361	Zhang H, Xie Y, Gu X, Li W, Zeng Y, Li S, et al. Management of Persistent Air Leaks Using Endobronchial Autologous Blood Patch and Spigot Occlusion: a Multicentre Randomized Controlled Trial in China. Respiration; international review of thoracic diseases. 2019;97(5):436-43.	Excluded by title
362	Zhang J, Zheng C, Zhu X, Zhang X, Hou Z, Zhou Z, et al. Ganji Formulation for Patients with Hepatocellular Carcinoma Who Have Undergone Surgery: a Multicenter, Randomized, Double-Blind, Controlled Trial. Evidence-based complementary & alternative medicine (ecam). 2019:1-6.	Excluded by title
363	Zheng W, Zhang X, Dong J, He J. Facial morphological characteristics of mouth breathers vs. nasal breathers: A systematic review and meta-analysis of lateral cephalometric data. Experimental and Therapeutic Medicine. 2020;19(6):3738-50.	Excluded by title
364	Ali B, Shaikh A, Fida M. CHANGES IN ORO-PHARYNGEAL AIRWAY DIMENSIONS AFTER TREATMENT WITH FUNCTIONAL APPLIANCE IN CLASS II SKELETAL PATTERN. J Ayub Med Coll Abbottabad. 2015;27(4):759-63.	Excluded by abstract
365	Ali B, Shaikh A, Fida M. Effect of Clark's twin-block appliance (CTB) and non-extraction fixed mechano-therapy on the pharyngeal dimensions of growing children. Dental Press Journal of Orthodontics. 2015;20(6):82-8.	Excluded by abstract
366	Amini M, Heravi F, Zandi B, Eslami S, Mohajerzadeh M, Rohani M. The effect of mandibular advancement device on physiologic parameters and volumetric MRI in mild to moderate obstructive sleep apnea-a randomized controlled trial. Sleep Medicine. 2017;40:e14-e5.	Excluded by abstract
367	Atik E, Gorucu-Coskuner H, Kocadereli I. Dentoskeletal and airway effects of the X-Bow appliance versus removable functional appliances (Frankel-2 and Trainer) in prepubertal Class II division 1 malocclusion patients. Australian Orthodontic Journal. 2017;33(1):3-13.	Excluded by abstract
368	Bollhalder J, Hanggi MP, Schatzle M, Markic G, Roos M, Peltomaki TA. Dentofacial and upper airway characteristics of mild and severe class II division 1 subjects. Eur J Orthod. 2013;35(4):447-53.	Excluded by abstract
369	Buschang PH, Jacob H, Carrillo R. The morphological characteristics, growth, and etiology of the hyperdivergent phenotype. Seminars in Orthodontics. 2013;19(4):212-26.	Excluded by abstract
370	Celikoglu M, Buyuk SK, Ekizer A, Unal T. Pharyngeal airway effects of Herbst and skeletal anchored Forsus FRD EZ appliances. Int J Pediatr Otorhinolaryngol. 2016;90:23-8.	Excluded by abstract
371	Chang DT, Zhou YH, Liu WT. [Evaluation of cone-beam computed tomography on upper airway changes after alternating rapid palatal expansion and constriction]. Beijing Da Xue Xue Bao Yi Xue Ban. 2017;49(4):685-90.	Excluded by abstract
372	Chang HP, Tseng YC, Chang HF. Treatment of mandibular prognathism. Journal of the Formosan Medical Association. 2006;105(10):781-90.	Excluded by abstract
373	Chokotiya H, Banthia A, Srinivasa Rao K, Choudhary K, Sharma P, Awasthi N. A study on the evaluation of pharyngeal size in different skeletal patterns: A radiographic study. Journal of Contemporary Dental Practice. 2018;19(10):1278-83.	Excluded by abstract
374	Ciavarella D, Lo Russo L, Mastrovincenzo M, Padalino S, Montaruli G, Giannatempo G, et al. Cephalometric evaluation of tongue position and airway remodelling in children treated with swallowing occlusal contact intercept appliance (S.O.C.I.A.). Int J Pediatr Otorhinolaryngol. 2014;78(11):1857-60.	Excluded by abstract
375	Da Costa MO, Monteiro P, De Silva DV, Da Rocha M, Joffly L. Sleep apnea in picnodisostosis: Case report. Sleep Science. 2020;13:59-60.	Excluded by abstract
376	de Almeida FR, Lowe AA, Otsuka R, Fastlicht S, Farbood M, Tsuiki S. Long-term sequellae of oral appliance therapy in obstructive sleep apnea patients: Part 2. Study-model analysis. American Journal of Orthodontics and Dentofacial Orthopedics. 2006;129(2):205-13.	Excluded by abstract
377	Defabjanis P. Impact of nasal airway obstruction on dentofacial development and sleep disturbances in children: preliminary notes. J Clin Pediatr Dent. 2003;27(2):95-100.	Excluded by abstract
378	Downarowicz P, Kawala B, Nowak R. Combined orthodontic and surgical treatment of skeletal class III malocclusion: A case report. Dental and Medical Problems. 2016;53(3):424-9.	Excluded by abstract
379	El H, Palomo JM. An airway study of different maxillary and mandibular sagittal positions. European Journal of Orthodontics. 2013;35(2):262-70.	Excluded by abstract
380	Fastuca R, Zecca PA, Caprioglio A. Role of mandibular displacement and airway size in improving breathing after rapid maxillary expansion. Prog Orthod. 2014;15(1):40.	Excluded by abstract
381	Fransson AMC, Tegelberg Å, Svenson BAH, Lennartsson B, Isacsson G. Influence of mandibular protruding device on airway passages and dentofacial characteristics in obstructive sleep apnea and snoring. American Journal of Orthodontics and Dentofacial Orthopedics. 2002;122(4):371-9.	Excluded by abstract
382	Fu Z, Lin Y, Ma L, Li W. Effects of maxillary protraction therapy on the pharyngeal airway in patients with repaired unilateral cleft lip and palate: A 3-dimensional computed tomographic study. Am J Orthod Dentofacial Orthop. 2016;149(5):673-82.	Excluded by abstract
383	Fujiki T, Deguchi T, Nagasaki T, Tanimoto K, Yamashiro T, Takano-Yamamoto T. Deglutitive tongue movement after correction of mandibular protrusion. Angle Orthod. 2013;83(4):591-6.	Excluded by abstract

384	Geoghegan F, Ahrens A, McGrath C, Hagg U. An evaluation of two different mandibular advancement devices on craniofacial characteristics and upper airway dimensions of Chinese adult obstructive sleep apnea patients. Angle Orthod. 2015;85(6):962-8.	Excluded by abstract
385	Giugliano V C, Gantz V JT. Malformaciones craneofaciales y obstrucción de vía aérea superior: ¿qué y cómo corregir? Rev pediatr electrón. 2016;13(1):47-60.	Excluded by abstract
386	Gotsopoulos H, Kelly JJ, Cistulli PA. Oral appliance therapy reduces blood pressure in obstructive sleep apnea: A randomized, controlled trial. Sleep. 2004;27(5):934-41.	Excluded by abstract
387	Gregg JM, Zedalis D, Howard CW, Boyle RP, Prussin AJ. Surgical alternatives for treatment of obstructive sleep apnoea: review and case series. Ann R Australas Coll Dent Surg. 2000;15:181-4.	Excluded by abstract
388	Gupta NK, Dwivedi R, Tandan A, Singh NS. An innovative design for mandibular repositioning appliance in treating obstructive sleep apnea and snoring. Indian Journal of Public Health Research and Development. 2012;3(1):19-23.	Excluded by abstract
389	Gursoy S, Hukki J, Hurmerinta K. Five year follow-up of mandibular distraction osteogenesis on the dentofacial structures of syndromic children. Orthod Craniofac Res. 2008;11(1):57-64.	Excluded by abstract
390	Hatab N, Jezdic Z, Stefanovic N, Jelovac D, Mudrak J, Konstantinovic V. Measuring the pharyngeal airway in 3 dimensions: A preliminary study. International Journal of Oral and Maxillofacial Surgery. 2013;42(10):1260.	Excluded by abstract
391	Heidsieck DSP, Koolstra JH, de Ruiter MHT, Hoekema A, de Lange J. Biomechanical effects of a mandibular advancement device on the temporomandibular joint. Journal of Cranio-Maxillofacial Surgery. 2018;46(2):288-92.	Excluded by abstract
392	Hennig M, Schneider D, Bschorer M, Goppold K, Schön G, Bschorer R. Distraction of the mandible-a safe procedure in mild to moderate cases. Journal of Oral and Maxillofacial Surgery. 2017;75(10):e386-e7.	Excluded by abstract
393	Hong JS, Oh KM, Kim BR, Kim YJ, Park YH. Three-dimensional analysis of pharyngeal airway volume in adults with anterior position of the mandible. Am J Orthod Dentofacial Orthop. 2011;140(4):e161-9.	Excluded by abstract
394	Hourfar J, Kinzinger GSM, Feifel H, Vehr VM, Lisson JA. Effects of combined orthodontic-orthognathic treatment for class II and III correction on posterior airway space: Comparison of mono- and bignathic osteotomies. Journal of Orofacial Orthopedics. 2017;78(6):455-65.	Excluded by abstract
395	Inoue K, Hosokawa S, Sato N, Sakakibara M, Ohashi K, Sugiyama T. Relationship between malocclusion and airway volume of children in the mixed dentition period. Pediatric Pulmonology. 2019;54:S116.	Excluded by abstract
396	Jakobsone G, Neimane L, Krumina G. Two- and three-dimensional evaluation of the upper airway after bimaxillary correction of Class III malocclusion. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2010;110(2):234-42.	Excluded by abstract
397	Keum BT, Choi SH, Choi YJ, Baik HS, Lee KJ. Effects of bodily retraction of mandibular incisors versus mandibular setback surgery on pharyngeal airway space: A comparative study. Korean Journal of Orthodontics. 2017;47(6):344-52.	Excluded by abstract
398	Kim YI, Kim SS, Son WS, Park SB. Pharyngeal airway analysis of different craniofacial morphology using cone-beam computed tomography (CBCT). Korean Journal of Orthodontics. 2009;39(3):136-45.	Excluded by abstract
399	Kim YJ, Hong JS, Hwang YI, Park YH. Three-dimensional analysis of pharyngeal airway in preadolescent children with different anteroposterior skeletal patterns. Am J Orthod Dentofacial Orthop. 2010;137(3):306.e1-11; discussion -7.	Excluded by abstract
400	Kondo E, Aoba TJ. Nonsurgical and nonextraction treatment of skeletal Class III open bite: its long-term stability. Am J Orthod Dentofacial Orthop. 2000;117(3):267-87.	Excluded by abstract
401	Learreta JA, Bono AE. Evaluación de las vías aéreas superiores en el diagnóstico ortodóncico. Ortodoncia. 1999;63(126):37-44.	Excluded by abstract
402	Li L, Wu W, Yan G, Liu L, Liu H, Li G, et al. Analogue simulation of pharyngeal airflow response to Twin Block treatment in growing patients with Class II(1) and mandibular retrognathia. Sci Rep. 2016;6:26012.	Excluded by abstract
403	Li ZM, Wu J, Men HY, Li HF. [Cone-beam CT study for the oropharyngeal airway volume and hyoid position of adults Class III skeletal malocclusion]. Shanghai Kou Qiang Yi Xue. 2015;24(3):351-5.	Excluded by abstract
404	Licciardello V, Carnemolla ME. Positional changes of hyoid bone and cranio-cervical posture following class III orthopedic treatment. Minerva Stomatol. 2005;54(11-12):635-46.	Excluded by abstract
405	Marino A, Ranieri R, Chiarotti F, Villa MP, Malagola C. Rapid maxillary expansion in children with Obstructive Sleep Apnoea Syndrome (OSAS). Eur J Paediatr Dent. 2012;13(1):57-63.	Excluded by abstract
406	McDonald JP. Airway problems in children: Can the orthodontist help? Annals Academy of Medicine Singapore. 1995;24(1):158-62.	Excluded by abstract
407	Mocellin M, Fugmann EA, Gavazzoni FB, Ataide ALd, Ouriques FL, Herrero Júnior F. Estudo cefalométrico-radiográfico e otorrinolaringológico correlacionando o grau de obstrução nasal e o padrão de crescimento facial em pacientes não tratados ortodonticamente. Rev bras otorrinolaringol. 2000;66(2):116-20.	Excluded by abstract
408	Molina F, Ortiz Monasterio F, de la Paz Aguilar M, Barrera J. Maxillary distraction: aesthetic and functional benefits in cleft lip-palate and prognathic patients during mixed dentition. Plast Reconstr Surg. 1998;101(4):951-63.	Excluded by abstract
409	Morales-Fernandez M, Iglesias-Linares A, Yanez-Vico RM, Mendoza-Mendoza A, Solano-Reina E. Bone- and dentoalveolar-anchored dentofacial orthopedics for Class III malocclusion: New approaches, similar objectives? A systematic review. Angle Orthodontist. 2013;83(3):540-52.	Excluded by abstract
410	Mucedero M, Pavoni C, Cozza P. Skeletal components and classification of Class III malocclusions. Mondo Ortodontico. 2009;34(3):165-78.	Excluded by abstract
411	Nguyen TV, Loudon ME. Upper airway obstruction and resultant growth factors influencing malocclusions. Int J Orthod Milwaukee. 2015;26(1):43-6.	Excluded by abstract
412	Ottaviano G, Maculan P, Borghetto G, Favero V, Galletti B, Savietto E, et al. Nasal function before and after rapid maxillary expansion in children: A randomized, prospective, controlled study. International Journal of Pediatric Otorhinolaryngology. 2018;115:133-8.	Excluded by abstract
413	Padma A, Ramakrishnan N, Narayanan V. Management of obstructive sleep apnea: A dental perspective. Indian J Dent Res. 2007;18(4):201-9.	Excluded by abstract
414	Paolucci ECd. Asociación entre mofología craneocervical y anomalías ortodóncicas con obstrucción respiratoria. Rev Fac Odontol [Córdoba]. 1992;19/20(1/2):79-85.	Excluded by abstract
415	Pirila-Parkkinen K, Pirttiniemi P, Nieminen P, Lopponen H, Tolonen U, Uotila R, et al. Cervical headgear therapy as a factor in obstructive sleep apnea syndrome. Pediatr Dent. 1999;21(1):39-45.	Excluded by abstract
416	Poets CF, Bacher M. Treatment of upper airway obstruction and feeding problems in Robin-like phenotype. Journal of Pediatrics. 2011;159(6):887-92.	Excluded by abstract
417	Prabhat KC, Goyal L, Bey A, Maheshwari S. Recent advances in the management of obstructive sleep apnea: The dental perspective. J Nat Sci Biol Med. 2012;3(2):113-7.	Excluded by abstract
418	Rahimi H. Re: Effects of maxillary protraction and fixed appliance therapy on the pharyngeal airway. Angle Orthod. 2009;79(5):i; author reply ii.	Excluded by abstract
419	Raskin S, Limme M. [Obstructive sleep apnea syndrome: the orthodontist's viewpoint]. Rev Belge Med Dent (1984). 1991;46(4):33-7.	Excluded by abstract
420	Rose E, Schessl J. Orthodontic procedures in the treatment of obstructive sleep apnea in children. J Orofac Orthop. 2006;67(1):58-67.	Excluded by abstract
421	Schendel S, Powell N, Jacobson R. Maxillary, mandibular, and chin advancement: treatment planning based on airway anatomy in obstructive sleep apnea. J Oral Maxillofac Surg. 2011;69(3):663-76.	Excluded by abstract
422	Shibata M, Tanikawa C, Yashiro K, Shintaku Y, Kogo M, Yamashiro T. Early dentofacial orthopedic treatment of a patient with maxillary hypoplasia and congenital central hypoventilation syndrome. Orthodontic Waves. 2014;73(1):29-33.	Excluded by abstract
423	Smahel Z, Mullerova Z, Nejedly A, Horak I. Changes in craniofacial development due to modifications of the treatment of unilateral cleft lip and palate. Cleft Palate Craniofac J. 1998;35(3):240-7.	Excluded by abstract
424	Sokucu O, Doruk C, Uysal OI. Comparison of the effects of RME and fan-type RME on nasal airway by using acoustic rhinometry. Angle Orthod. 2010;80(5):870-5.	Excluded by abstract
425	Solano-Mendoza B, Iglesias-Linares A, Yanez-Vico RM, Mendoza-Mendoza A, Alio-Sanz JJ, Solano-Reina E. Maxillary protraction at early ages.	Excluded by

	The revolution of new bone anchorage appliances. J Clin Pediatr Dent. 2012;37(2):219-29.	abstract
426	Solow B, Tallgren A. Head Posture and Craniofacial Morphology. American Journal of Physical Anthropology. 1976;44(3):417-35.	Excluded by abstract
427	Stellzig-Eisenhauer A, Meyer-Marcotty P. [Interaction between otorhinolaryngology and orthodontics: correlation between the nasopharyngeal airway and the craniofacial complex]. Laryngorhinootologie. 2010;89 Suppl 1:S72-8.	Excluded by abstract
428	Sutherland K, Chan ASL, Cistulli PA. Three-dimensional assessment of anatomical balance and oral appliance treatment outcome in obstructive sleep apnoea. Sleep and breathing. 2016;20(3):903-10.	Excluded by abstract
429	Tangugsorn V, Skatvedt O, Krogstad O, Lyberg T. Obstructive sleep apnoea: a cephalometric study. Part I. Cervico-craniofacial skeletal morphology. Eur J Orthod. 1995;17(1):45-56.	Excluded by abstract
430	Tapia IE, Marcus CL. Newer treatment modalities for pediatric obstructive sleep apnea. Paediatric Respiratory Reviews. 2013;14(3):199-203.	Excluded by abstract
431	Tarkar JS, Parashar S, Gupta G, Bhardwaj P, Maurya RK, Singh A, et al. An Evaluation of Upper and Lower Pharyngeal Airway Width, Tongue Posture and Hyoid Bone Position in Subjects with Different Growth Patterns. J Clin Diagn Res. 2016;10(1):Zc79-83.	Excluded by abstract
432	Twardokęs M, Paluch Z, Stelmańska K, Ura-Sabat K, Gamrot-Wrzoł M, Zieliński M, et al. Morphometric relationships between the upper respiratory tract and the craniofacial bone structures. Journal of Stomatology. 2016;69(5):482-91.	Excluded by abstract
433	Ulkur F, Uyar VO, Ozdemir F, Guzel MZ. Interdisciplinary orthognathic treatment of high angle class III malocclusion. Niger J Clin Pract. 2015;18(1):144-8.	Excluded by abstract
434	Wang W, Di C, Mona S, Wang L, Hans M. Tongue function: An underrecognized component in the treatment of obstructive sleep apnea with mandibular repositioning appliance. Canadian Respiratory Journal. 2018;2018.	Excluded by abstract
435	Yassaei S, Bahrololoomi Z, Sorush M. Changes of tongue position and oropharynx following treatment with functional appliance. J Clin Pediatr Dent. 2007;31(4):287-90.	Excluded by abstract
436	Miotti A, Miotti F, Miotti B. [Teleradiographic study of the changes of the pharyngeal and of the intermaxillary space in cases of orthodontically treated class III malocclusion]. Mondo ortodontico. 1979;4(2):25-7.	Excluded; missing full-text
437	Miotti A, Miotti F, Miotti B. [Dento-alveolar skeletal and pharyngeal space modifications in cases of Class III, treated orthodontically]. Mondo ortodontico. 1979;4(2):53-69.	Excluded; missing full-text
438	Büyükçavuş MH. Alternate Rapid Maxillary Expansion and Constriction (Alt-RAMEC) protocol: A comprehensive literature review. Turkish Journal of Orthodontics. 2019;32(1):47-51.	Excluded; no clinical study
439	Indriksone I, Jakobsone G. The upper airway dimensions in different sagittal craniofacial patterns: a systematic review. Stomatologija. 2014;16(3):109-17.	Excluded; no clinical study
440	Kachinski A, Azanha JM, Campos PD, Corrêa CdC, Campos LD. Avaliação das vias aéreas superiores por meio de tomografia computadorizada de feixe cônico em indivíduos submetidos à cirurgia ortognática: revisão de literatura. Rev Salusvita (Online). 2018;37(2):405-19.	Excluded; no clinical study
441	Oliveira DMCNSd, Santana VC, Santos Júnior JHd. Avaliação do espaço aéreo faríngeo em pacientes submetidos ao tratamento ortopédico-ortodôntico – revisão de literatura. Ortho Sci, Orthod sci pract. 2014;7(26):230-7.	Excluded; no clinical study
442	Lee WC, Tu YK, Huang CS, Chen R, Fu MW, Fu E. Pharyngeal airway changes following maxillary expansion or protraction: A meta-analysis. Orthodontics & Craniofacial Research. 2018;21(1):4-11.	Excluded; review
443	Ming Y, Hu Y, Li Y, Yu J, He H, Zheng L. Effects of maxillary protraction appliances on airway dimensions in growing class III maxillary retrognathic patients: A systematic review and meta-analysis. International Journal of Pediatric Otorhinolaryngology. 2018;105:138-45.	Excluded; review
444	Mousoulea S, Tsolakis I, Ferdianakis E, Tsolakis AI. The Effect of Chin-cup Therapy in Class III Malocclusion: A Systematic Review. Open Dentistry Journal. 2016;10:664-79.	Excluded; review
445	Borborema dos Santos VD, Assis GMd, Pereira da Silva JS, Rocha Germano A. Glosectomía parcial en paciente portador del síndrome de Beckwith-Wiedemann: relato del caso presentation of a case. Revista Española de Cirugía Oral y Maxilofacial. 2015;37(4):202-6.	Excluded; case report / series
446	Hoshijima M, Honjo T, Moritani N, Iida S, Yamashiro T, Kamioka H. Maxillary Advancement for Unilateral Crossbite in a Patient with Sleep Apnea Syndrome. Acta Medica Okayama. 2015;69(3):177-82.	Excluded; case report / series
447	Guimarães MdLR, Pereira JBB, Jardim FFT, Costa TMMd, Becattini PR, Hermont AP. Efetividade em Longo-Prazo de dois Aparelhos Intraorais no Tratamento da Apneia Obstrutiva do Sono: Relato de um Caso. UNOPAR Cient, Ciênc biol saude. 2014;16(4).	Excluded; case report / series
448	Afzal E, Fida M. Evaluation of the change in the tongue posture and in the hyoid bone position after Twin Block appliance therapy in skeletal class II subjects. Dental and Medical Problems. 2019;56(4):379-84.	Excluded; no Class III malocclusion
449	Alhammadi MS, Elfeky HY, Fayed MS, Ishaq RAR, Halboub E, Al-Mashraqi AA. Three-dimensional skeletal and pharyngeal airway changes following therapy with functional appliances in growing skeletal Class II malocclusion patients : A controlled clinical trial. J Orofac Orthop. 2019;80(5):254-65.	Excluded; no Class III malocclusion
450	Amuk NG, Kurt G, Baysal A, Turker G. Changes in pharyngeal airway dimensions following incremental and maximum bite advancement during Herbst-rapid palatal expander appliance therapy in late adolescent and young adult patients: a randomized non-controlled prospective clinical study. European Journal of Orthodontics. 2019;41(3):322-30.	Excluded; no Class III malocclusion
451	An S-Y, Park S-Y, Youn-Soo S, 홍기상, 김아현. Oropharyngeal Airway Dimensional Changes after Treatment with Myobrace (Trainer for Kids (T4K)) in Class II Retrognathic Children. Journal of Korean academy of Advanced General Dentistry. 2015;4(2):39-50.	Excluded; no Class III malocclusion
452	Anusuya V, Jena AK, Sharan J. Effects of functional appliance treatment on pharyngeal airway passage dimensions in Class II malocclusion subjects with retrognathic mandibles: A systematic review. Apos Trends in Orthodontics. 2019;9(3):138-48.	Excluded; no Class III malocclusion
453	Basciftci FA, Mutlu N, Karaman AI, Malkoc S, Kucukkolbasi H. Does the timing and method of rapid maxillary expansion have an effect on the changes in nasal dimensions? Angle Orthod. 2002;72(2):118-23.	Excluded; no Class III malocclusion
454	Chiari S, Romsdorfer P, Swoboda H, Bantleon HP, Freudenthaler J. Effects of rapid maxillary expansion on the airways and ears - A pilot study. European Journal of Orthodontics. 2009;31(2):135-41.	Excluded; no Class III malocclusion
455	Chiari S, Romsdorfer P, Swoboda H, Bantleon H-P, Freudenthaler J. Effects of rapid maxillary expansion on the airways and ears-025EFa pilot study. European Journal of Orthodontics. 2009;31(2):135-41.	Excluded; no Class III malocclusion
456	Chiari S, Romsdorfer P, Swoboda H, Bantleon HP, Freudenthaler J. Effects of rapid maxillary expansion on the airways and ears--a pilot study. Eur J Orthod. 2009;31(2):135-41.	Excluded; no Class III malocclusion
457	Coceancig P. Introducing the IMDO protocol into practical private orthognathic practice for first line management of adolescent class ii malocclusion. International Journal of Oral and Maxillofacial Surgery. 2019;48:114.	Excluded; no Class III malocclusion
458	Cortese M, Pigato G, Casiraghi G, Ferrari M, Bianco E, Maddalone M. Evaluation of the oropharyngeal airway space in class II malocclusion treated with mandibular activator: A retrospective study. Journal of Contemporary Dental Practice. 2020;21(6):666-72.	Excluded; no Class III malocclusion
459	Deng L, He H, Ngan P. 2-D and 3-D Evaluation of Upper Airway Changes After Maxillary Expansion with the Alt-RAMEC Protocol. Wuhan Daxue Xuebao (Yixue Ban). 2016;37(6):960-4.	Excluded; no Class III malocclusion
460	Durán-Cantolla J, Aizpuru F, Miranda E, Alkhraisat M-H, Anitua E, Crovetto-Martínez R, et al. Efficacy of mandibular advancement device in the treatment of obstructive sleep apnea syndrome: A randomized controlled crossover clinical trial. Med oral patol oral cir bucal (Internet). 2015;20(5):605-15.	Excluded; no Class III malocclusion
461	Jacob HB, Santo MD, Bosio JA. Extrações ortodônticas de pré-molares e seus efeitos nas vias aéreas respiratórias superiores revisão da	Excluded; no

	literatura. Ortho Sci, Orthod sci pract. 2017;10(37):106-11.	Class III malocclusion
462	Kirjavainen M, Kirjavainen T. Upper airway dimensions in class II Malocclusion - Effects of headgear treatment. Angle Orthodontist. 2007;77(6):1046-53.	Excluded; no Class III malocclusion
463	Machado-Júnior A-J, Signorelli L-G, Zancanella E, Crespo A-N. Randomized controlled study of a mandibular advancement appliance for the treatment of obstructive sleep apnea in children: A pilot study. Med oral patol oral cir bucal (Internet). 2016;21(4):e403-e7.	Excluded; no Class III malocclusion
464	Prescinotto R, Haddad FLM, Fukuchi I, Gregório LC, Cunali PA, Tufik S, et al. Impact of upper airway abnormalities on the success and adherence to mandibular advancement device treatment in patients with Obstructive Sleep Apnea Syndrome. Braz j otorhinolaryngol (Impr). 2015;81(6):663-70.	Excluded; no Class III malocclusion
465	Rădescu OD, Colosi HA, Albu S. Effects of rapid palatal expansion (RPE) and twin block mandibular advancement device (MAD) on pharyngeal structures in Class II pediatric patients from Cluj-Napoca, Romania. Cranio. 2020;38(1):22-9.	Excluded; no Class III malocclusion
466	Silva FBNN, Cavalieri-Pereira L, Pedroso-Oliveira G, Rocha JLS, Brancher GQB. Orthognathic surgery with mandibular osteotomy modified for OSAS treatment in class II patient. International Journal of Oral and Maxillofacial Surgery. 2019;48:277.	Excluded; no Class III malocclusion
467	Silva Filho OGd, Lara TS, Ayub PV, Ohashi ASC, Bertoz FA. Photographic assessment of nasal morphology following rapid maxillary expansion in children. J appl oral sci. 2011;19(5):535-43.	Excluded; no Class III malocclusion
468	Singh GD, Garcia-Motta AV, Hang WM. Evaluation of the posterior airway space following Biobloc therapy: geometric morphometrics. Cranio. 2007;25(2):84-9.	Excluded; no Class III malocclusion
469	Sökücü O, Doruk C, Uysal OI. Comparison of the effects of RME and fan-type RME on nasal airway by using acoustic rhinometry Oral. Angle Orthodontist. 2010;80(5):870-5.	Excluded; no Class III malocclusion
470	Teixeira AOdB. Uso de aparelho de protrusão mandibular como recurso para tratamento da síndrome da apnéia obstrutiva do sono. 2008. p. 119-.	Excluded; no Class III malocclusion
471	Thakur VK, Londhe SM, Kumar P, Sharma M, Jain A, Pradhan I. Evaluation and quantification of airway changes in Class II division 1 patients undergoing myofunctional therapy using twin block appliance. Medical Journal Armed Forces India. 2020.	Excluded; no Class III malocclusion
472	Wiedemeyer V, Berger M, Martini M, Kramer FJ, Heim N. Predictability of pharyngeal airway space dimension changes after orthognathic surgery in class II patients: A mathematical approach. Journal of Cranio-Maxillofacial Surgery. 2019;47(10):1504-9.	Excluded; no Class III malocclusion
473	Cunha TCA, GuimarÃEs TdM, Schultz TCB, Almeida FRd, Cunha TM, Simamoto Junior PC, et al. Predictors of success for mandibular repositioning appliance in obstructive sleep apnea syndrome. Braz oral res (Online). 2017;31:e37-e.	Excluded; obstructive sleep apnea patients
474	Freire-Maia BAV. A influência da obstrução das vias aéreas superiores na determinação do tipo facial. 2009. p. 96-.	Excluded; obstructive sleep apnea patients
475	Juliano ML, Machado MAC, Carvalho LBCd, Prado LBFd, Prado GFd. Mouth breathing children have cephalometric patterns similar to those of adult patients with obstructive sleep apnea syndrome. Arq neuropsiquiatr. 2009;67(3b):860-5.	Excluded; obstructive sleep apnea patients
476	Li Y, Wu J, Guo J, Yu L, Wang J, Li X, et al. The efficacy of different treatment approaches for pediatric OSAHS patients with mandibular retrognathia: study protocol for a multicenter randomized controlled trial. Trials. 2020;21(1):595.	Excluded; obstructive sleep apnea patients
477	Mayer G, Meierewert K. Cephalometric Predictors for Orthopedic Mandibular Advancement in Obstructive Sleep-Apnea. European Journal of Orthodontics. 1995;17(1):35-43.	Excluded; obstructive sleep apnea patients
478	Pliska BT, Nam H, Chen H, Lowe AA, Almeida FR. Obstructive Sleep Apnea and Mandibular Advancement Splints: Occlusal Effects and Progression of Changes Associated with a Decade of Treatment. Journal of Clinical Sleep Medicine. 2014;10(12):1285-91.	Excluded; obstructive sleep apnea patients
479	Quintela MdM, Lima Júnior A, Sallum RA, Pacheco Filho F, Flório FM, Motta RHL. Avaliação da eficácia de um aparelho de avanço mandibular semiflexível na apneia obstrutiva do sono: estudo clínico e polissonográfico. Ortodontia. 2013;46(4):358-69.	Excluded; obstructive sleep apnea patients
480	Quo S, Lo LF, Guilleminault C. Maxillary protraction to treat pediatric obstructive sleep apnea and maxillary retrusion: a preliminary report. Sleep Med. 2019;60:60-8.	Excluded; obstructive sleep apnea patients
481	Quo SD, Hyunh N, Guilleminault C. Bimaxillary expansion therapy for pediatric sleep-disordered breathing. Sleep Medicine. 2017;30:45-51.	Excluded; obstructive sleep apnea patients
482	Schendel S, Powell N, Jacobson R. Maxillary, Mandibular, and Chin Advancement: Treatment Planning Based on, Airway Anatomy in Obstructive Sheep Apnea. Journal of Oral and Maxillofacial Surgery. 2011;69(3):663-76.	Excluded; obstructive sleep apnea patients
483	Segovia D. Síndrome de apnea-hipoapnea obstructiva del sueño en adultos. Detección y tratamiento en ortodoncia. Ortodoncia. 2016;80(160):42-8.	Excluded; obstructive sleep apnea patients
484	Smatt Y, Ferri J. Retrospective study of 18 patients treated by maxillomandibular advancement with adjunctive procedures for obstructive sleep apnea syndrome. Journal of Craniofacial Surgery. 2005;16(5):770-7.	Excluded; obstructive sleep apnea patients
485	Sturzinger GPS, Lima BC, Rodrigues GGN, Ferreira VF, Oliveira SM, Vianna ALB, et al. Hilotherapy treatment in postoperative surgery in a patient with severe osahs. International Journal of Oral and Maxillofacial Surgery. 2019;48:165.	Excluded; obstructive sleep apnea patients
486	Vinha PP, Santos GP, Bandão G, Fagnani Filho A. Ronco e apneia do sono: apresentação de novo dispositivo intra-oral e protocolo de tratamento. RGO (Porto Alegre). 2010;58(4):515-20.	Excluded; obstructive sleep apnea patients
487	Abramova MY, Alimova AV, Slabkovskaya AB, Alekseeva AA. Analysis of oral soft tissues, airways and tongue by the results of complex rehabilitation of patients with angle class III malocclusion. Annals of Tropical Medicine and Public Health. 2018;9(Special Issue):S611.	Excluded; no orthopedic treatment
488	Alves PVM, Zhao L, O'Gara M, Patel PK, Bolognese AM. Three-Dimensional Cephalometric Study of Upper Airway Space in Skeletal Class II and III Healthy Patients. Journal of Craniofacial Surgery. 2008;19(6):1497-507.	Excluded; no orthopedic treatment
489	Arkuszewski P, Gaszynska E, Przygonski A. A method for determination of tongue size in patients with mandibular prognathism. Roczniki Pomorskiej Akademii Medycznej w Szczecinie. 2006;52(Suppl. 3):125-9.	Excluded; no orthopedic

		treatment
490	Athanasiou AE, Toutountzakis N, Mavreas D, Ritzau M, Wenzel A. Alterations of Hyoid Bone Position and Pharyngeal Depth and Their Relationship after Surgical-Correction of Mandibular Prognathism. American Journal of Orthodontics and Dentofacial Orthopedics. 1991;100(3):259-65.	Excluded; no orthopedic treatment
491	Azevedo WRdS, Feitoza CC, Vargas Junior CS, Pizzol KEDC. Changes in head posture, hyoid bone position and airway dimensions after orthognatic surgery. Braz j oral sci. 2018;17:e18030-e.	Excluded; no orthopedic treatment
492	Chou PY, Denadai R, Yao CF, Chen YA, Chang CS, Lin CC, et al. History and Evolution of Orthognathic Surgery at Chang Gung Craniofacial Center: Lessons Learned From 35-Year Experience. Ann Plast Surg. 2020;84(1S Suppl 1):S60-s8.	Excluded; no orthopedic treatment
493	Coeugniet E, Pellerin P, Wolber A, Dhellemmes P, Vinchon M. Fifteen years of experience with the midfacial distraction without maxillary osteotomy protocol. Childs Nervous System. 2014;30(4):681-8.	Excluded; no orthopedic treatment
494	Cota R, Goto A. Surgical treatment for dentofacial deformities: class III patient with mandibular laterodeviation and anterior open bite. International Journal of Oral and Maxillofacial Surgery. 2019;48:191.	Excluded; no orthopedic treatment
495	da Silva Machado V, Cantharino de Carvalho BA, Vedovello SAS, Valdrighi H, Santamaria Júnior M. Pharyngeal Airway Modifications in Skeletal Class III Patients Undergoing Bimaxillary Advancement Surgery. J Oral Maxillofac Surg. 2019;77(10):2126.e1-.e8.	Excluded; no orthopedic treatment
496	Gornic C, Nascimento PPd, Melgaço CA, Ruellas ACdO, Medeiros PJDA, Sant'Anna EF. Análise cefalométrica das vias aéreas superiores de pacientes Classe III submetidos a tratamento ortocirúrgico subjected to orthosurgical treatment. Dental Press Journal of Orthodontics. 2011;16(5):82-8.	Excluded; no orthopedic treatment
497	Hochban W, Schurmann R, Brandenburg U, Conradt R. Mandibular setback for surgical correction of mandibular hyperplasia - Does it provoke sleep related breathing disorders? International Journal of Oral and Maxillofacial Surgery. 1996;25(5):333-8.	Excluded; no orthopedic treatment
498	Hourfar J, Kinzinger GSM, Feifel H, Vehr VM, Lisson JA. Effects of combined orthodontic-orthognathic treatment for class II and III correction on posterior airway space. Journal of Orofacial Orthopedics-Fortschritte Der Kieferorthopadie. 2017;78(6):455-65.	Excluded; no orthopedic treatment
499	Jayaratne YSN, Zwahlen RA. The Oropharyngeal Airway in Young Adults with Skeletal Class II and Class III Deformities: A 3-D Morphometric Analysis. Plos One. 2016;11(2).	Excluded; no orthopedic treatment
500	Lee SH, 김정재. Changes of airway after orthognathic surgery for patients with skeletal class III malocclusion. Journal of Korean society of Dental Hygiene. 2018;18(4):525-33.	Excluded; no orthopedic treatment
501	Lye KW. Effect of orthognathic surgery on the posterior airway space (PAS). Annals Academy of Medicine Singapore. 2008;37(8):677-82.	Excluded; no orthopedic treatment
502	Moscarino S, Kötter F, Brandt M, Modabber A, Kniha K, Hölzle F, et al. Influence of different surgical concepts for moderate skeletal class II and III treatment on the nasopharyngeal airway space. Journal of Cranio-Maxillofacial Surgery. 2019;47(10):1489-97.	Excluded; no orthopedic treatment
503	On SW, Kim HJ, Cho DH, Moon YR, Song SI. Silent Changes in Sleep Quality Following Mandibular Setback Surgery in Patients with Skeletal Class III Malocclusion: A Prospective Study. Scientific Reports. 2019;9.	Excluded; no orthopedic treatment
504	Parsi GK, Alsulaiman AA, Kotak B, Mehra P, Will LA, Motro M. Volumetric changes of the upper airway following maxillary and mandibular advancement using cone beam computed tomography. International Journal of Oral and Maxillofacial Surgery. 2019;48(2):203-10.	Excluded; no orthopedic treatment
505	Rabelo Bozzini MF, Valladares-Neto J, de Paiva JB, Rino-Neto J. Sex differences in pharyngeal airway morphology in adults with skeletal Class III malocclusion. Cranio-the Journal of Craniomandibular & Sleep Practice. 2018;36(2):98-105.	Excluded; no orthopedic treatment
506	Saitoh K. Long-term changes in pharyngeal airway morphology after mandibular set-back surgery. American Journal of Orthodontics and Dentofacial Orthopedics. 2004;125(5):556-61.	Excluded; no orthopedic treatment
507	Tseng Y-C, Hsiao S-Y, Cheng J-H, Hsu K-J, Chen C-M. Postoperative Skeletal Stability and Pharyngeal Airway: Counterclockwise versus Clockwise Rotation during Mandibular Setback Surgery. Biomed Research International. 2020;2020.	Excluded; no orthopedic treatment
508	Tseng Y-C, Lai S, Lee H-E, Chen K-K, Chen C-M. Are Hyoid Bone and Tongue the Risk Factors Contributing to Postoperative Relapse for Mandibular Prognathism? Biomed Research International. 2016;2016.	Excluded; no orthopedic treatment
509	Wang H-W, Li L-Y, Qi S-Q, Yan M. [Cone-beam computed tomography evaluation of short- and long-term airway changes in patients with skeletal Class Ⅲ malocclusion treated by orthodontic therapy and bimaxillary surgery with or without mandibular setback surgery]. Shanghai kou qiang yi xue = Shanghai journal of stomatology. 2016;25(4):487-91.	Excluded; no orthopedic treatment
510	Wenzel A, Williams S, Ritzau M. Changes in Head Posture and Nasopharyngeal Airway Following Surgical-Correction of Mandibular Prognathism. European Journal of Orthodontics. 1989;11(1):37-42.	Excluded; no orthopedic treatment
511	Yoshida K, Sakuda M, Takada K, Tsuchiya M. Changes of Tongue Function after Orthognathic Surgery in Class-Iii Cases. Journal of Dental Research. 1987;66:161-.	Excluded; no orthopedic treatment
512	이규홍, 황용인, 김윤지, 천세환, 김형욱, 박준우, et al. Changes in tongue position, airway width, gonial angle, lower facial height after bilateral sagittal split ramus osteotomy in mandibular prognathic patients. Journal of the Korean Association of Oral and Maxillofacial Surgeons. 2007;33(2):109-13.	Excluded; no orthopedic treatment
513	Chen X, Liu D, Liu J, Wu Z, Xie Y, Li L, et al. Three-Dimensional Evaluation of the Upper Airway Morphological Changes in Growing Patients with Skeletal Class III Malocclusion Treated by Protraction Headgear and Rapid Palatal Expansion: A Comparative Research. PLoS One. 2015;10(8):e0135273.	Excluded; no untreated Class III group
514	Danaie SM, Salehi P. Cephalometric evaluation of class-III patients with chin cap and tongue guard. J Indian Soc Pedod Prev Dent. 2005;23(2):63-6.	Excluded; no untreated Class III group
515	Fareen N, Alam MK, Khamis MF, Mokhtar N. Treatment effects of two different appliances on pharyngeal airway space in mixed dentition Malay children. Int J Pediatr Otorhinolaryngol. 2019;125:159-63.	Excluded; no untreated Class III group
516	Graber LW. Hyoid changes following orthopedic treatment of mandibular prognathism. Angle Orthod. 1978;48(1):33-8.	Excluded; no untreated Class III group
517	Hiyama S, Suda N, Ishii-Suzuki M, Tsuiki S, Ogawa M, Suzuki S, et al. Effects of Maxillary Protraction on Craniofacial Structures and Upper-Airway Dimension. Angle Orthod. 2002;72(1):43-7.	Excluded; no untreated Class III group

518	Hwang DM, Lee JY, Choi YJ, Hwang CJ. Evaluations of the tongue and hyoid bone positions and pharyngeal airway dimensions after maxillary protraction treatment. Cranio. 2018:1-9.	Excluded; no untreated Class III group
519	Hwang DM, Lee JY, Choi YJ, Hwang CJ. Evaluations of the tongue and hyoid bone positions and pharyngeal airway dimensions after maxillary protraction treatment. Cranio. 2019;37(4):214-22.	Excluded; no untreated Class III group
520	Katyal V, Wilmes B, Nienkemper M, Darendeliler MA, Sampson W, Drescher D. The efficacy of Hybrid Hyrax-Mentoplate combination in early Class III treatment: a novel approach and pilot study. Australian Orthodontic Journal. 2016;32(1):88-96.	Excluded; no untreated Class III group
521	Kaygisiz E, Tuncer BB, Yuksel S, Tuncer C, Yildiz C. Effects of maxillary protraction and fixed appliance therapy on the pharyngeal airway. Angle Orthod. 2009;79(4):660-7.	Excluded; no untreated Class III group
522	Lee JW, Park KH, Kim SH, Park YG, Kim SJ. Correlation between skeletal changes by maxillary protraction and upper airway dimensions. Angle Orthod. 2011;81(3):426-32.	Excluded; no untreated Class III group
523	Lee KM, Chung DH, Lee JW, Lee SM. Cervical vertebrae maturation, dentoalveolar, head postural and respiratory parameters in predicting the stable outcome of face-mask treatment. Eur J Orthod. 2015;37(3):251-6.	Excluded; no untreated Class III group
524	Mitani Y, Banabilh SM, Singh GD. Craniofacial changes in patients with Class III malocclusion treated with the RAMPA system. Int J Orthod Milwaukee. 2010;21(2):19-25.	Excluded; no untreated Class III group
525	Nguyen T, De Clerck H, Wilson M, Golden B. Effect of Class III bone anchor treatment on airway. Angle Orthod. 2015;85(4):591-6.	Excluded; no untreated Class III group
526	Oktay H, Ulukaya E. Maxillary protraction appliance effect on the size of the upper airway passage. Angle Orthod. 2008;78(2):209-14.	Excluded; no untreated Class III group
527	Onem Ozbilen E, Yilmaz HN, Kucukkeles N. Comparison of the effects of rapid maxillary expansion and alternate rapid maxillary expansion and constriction protocols followed by facemask therapy. Korean J Orthod. 2019;49(1):49-58.	Excluded; no untreated Class III group
528	Pamporakis P, Nevzatoglu S, Kucukkeles N. Three-dimensional alterations in pharyngeal airway and maxillary sinus volumes in Class III maxillary deficiency subjects undergoing orthopedic facemask treatment. Angle Orthod. 2014;84(4):701-7.	Excluded; no untreated Class III group
529	Sayinsu K, Isik F, Arun T. Sagittal airway dimensions following maxillary protraction: a pilot study. Eur J Orthod. 2006;28(2):184-9.	Excluded; no untreated Class III group
530	Akin M, Ucar FI, Chousein C, Sari Z. Effects of chincup or facemask therapies on the orofacial airway and hyoid position in Class III subjects. J Orofac Orthop. 2015;76(6):520-30.	Included
531	Baccetti T, Franchi L, Mucedero M, Cozza P. Treatment and post-treatment effects of facemask therapy on the sagittal pharyngeal dimensions in Class III subjects. Eur J Orthod. 2010;32(3):346-50.	Included
532	Balos Tuncer B, Ulusoy C, Tuncer C, Turkoz C, Kale Varlik S. Effects of reverse headgear on pharyngeal airway in patients with different vertical craniofacial features. Braz Oral Res. 2015;29.	Included
533	Cretella Lombardo E, Franchi L, Lione R, Chiavaroli A, Cozza P, Pavoni C. Evaluation of sagittal airway dimensions after face mask therapy with rapid maxillary expansion in Class III growing patients. Int J Pediatr Otorhinolaryngol. 2020;130:109794.	Included
534	Danaei SM, Ajami S, Etemadi H, Azadeh N. Assessment of the effect of maxillary protraction appliance on pharyngeal airway dimensions in relation to changes in tongue posture. Dent Res J 2018;15:208-14.	Included
535	Kilinc AS, Arslan SG, Kama JD, Ozer T, Dari O. Effects on the sagittal pharyngeal dimensions of protraction and rapid palatal expansion in Class III malocclusion subjects. Eur J Orthod. 2008;30(1):61-6.	Included
536	Menendez-Diaz I, Muriel J, Cobo JL, Alvarez C, Cobo T. Early treatment of Class III malocclusion with facemask therapy. Clin Exp Dent Res. 2018;4(6):279-83.	Included
537	Mucedero M, Baccetti T, Franchi L, Cozza P. Effects of maxillary protraction with or without expansion on the sagittal pharyngeal dimensions in Class III subjects. Am J Orthod Dentofacial Orthop. 2009;135(6):777-81.	Included
538	Tuncer BB, Kaygisiz E, Tuncer C, Yuksel S. Pharyngeal airway dimensions after chin cup treatment in Class III malocclusion subjects. J Oral Rehabil. 2009;36(2):110-7.	Included
539	Yagci A, Uysal T, Usumez S, Orhan M. Effects of modified and conventional facemask therapies with expansion on dynamic measurement of natural head position in Class III patients. Am J Orthod Dentofacial Orthop. 2011;140(5):e223-31.	Included

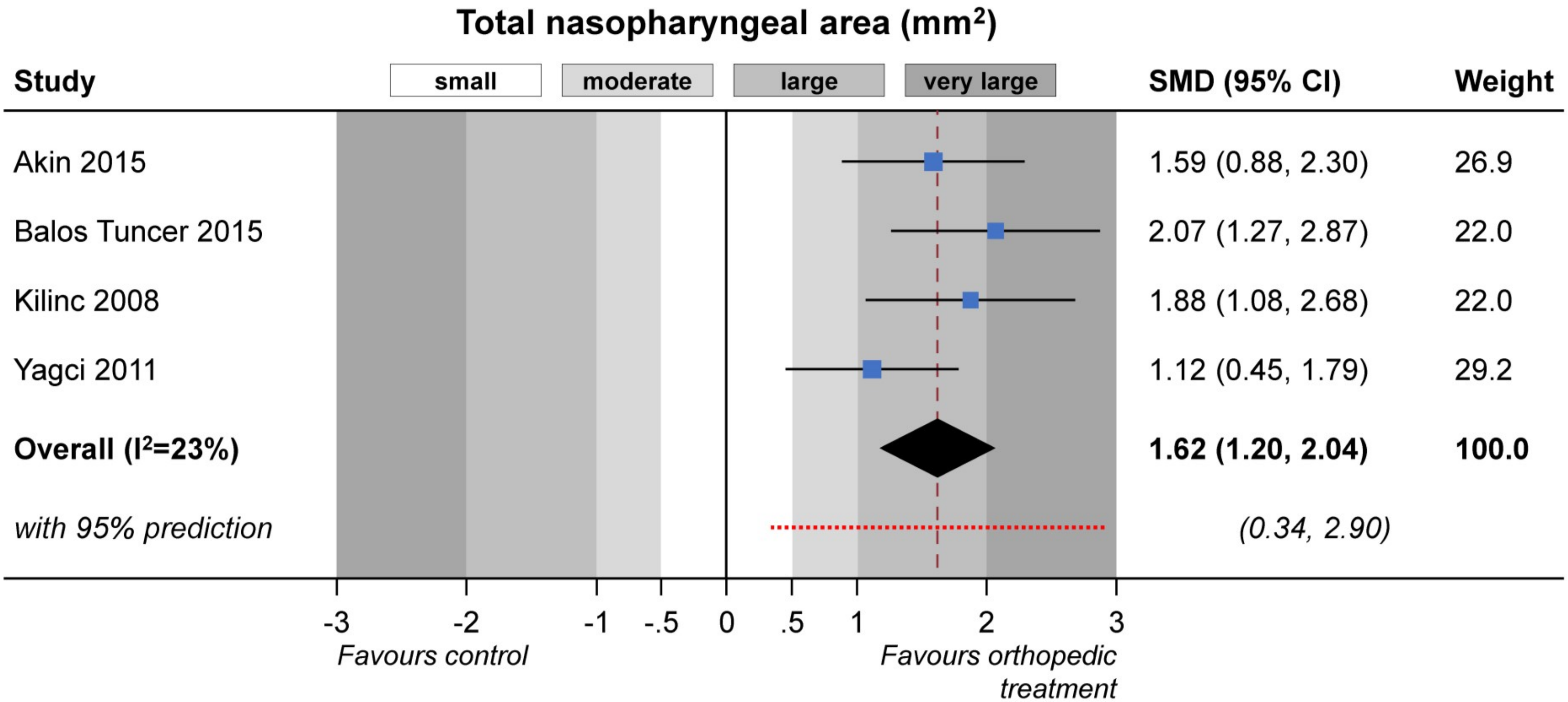
Supplementary Material S5. Results of individual studies comparing maxillary protraction to untreated controls that are not included in meta-analyses.

Nr	Study	Outcome*	MD (95% CI)	P	CR
1	Kilinc 2008	Total airway area (mm^2)	222.86 (14.04, 431.68)	**0.04**	**Yes**
2	Tuncer 2015	Nasopharynx: AA'-Pm' (mm)	1.55 (0.65, 2.46)	**0.001**	**No**
3	Tuncer 2015	Nasopharynx: Pm'-SPL (mm)	-1.25 (-2.37, -0.14)	**0.03**	**No**
4	Tuncer 2015	Nasopharynx: S-PNS (mm)	0.15 (-0.95, 1.25)	0.79	-
5	Mucedero 2009; Baccetti 2010	Nasopharynx: PNS-Ba (mm)	1.72 (0.24, 3.20)	**0.02**	**No**
6	Mucedero 2009; Baccetti 2010	Nasopharynx: PNS-H (mm)	1.41 (0.24, 2.59)	**0.02**	**No**
7	Mucedero 2009; Baccetti 2010	Nasopharynx: Ptm-Ba (mm)	1.34 (0.26, 2.42)	**0.02**	**No**
8	Tuncer 2015	Oropharynx: eb-Peb (mm)	1.25 (0.09, 2.41)	**0.04**	**No**
9	Tuncer 2015	Oropharynx: IPS (mm)	0.05 (-1.16, 1.26)	0.94	-
10	Tuncer 2015	Oropharynx: MPS (mm)	1.20 (0.39, 2.01)	**0.004**	**No**
11	Tuncer 2015	Oropharynx: AA-PNS (mm)	0.40 (-0.51, 1.31)	0.39	-
12	Tuncer 2015	Oropharynx: SPS (mm)	0.35 (-0.56, 1.26)	0.45	-
13	Tuncer 2015	Oropharynx: ve-Pve (mm)	1.05 (0.19, 1.91)	**0.02**	**No**
14	Kilinc 2008	Oropharynx: APW-PPW (mm)	1.27 (-0.83, 3.37)	0.24	-
15	Kilinc 2008	Oropharynx: APW'-PPW' (mm)	5.00 (0.75, 9.25)	**0.02**	**Yes**

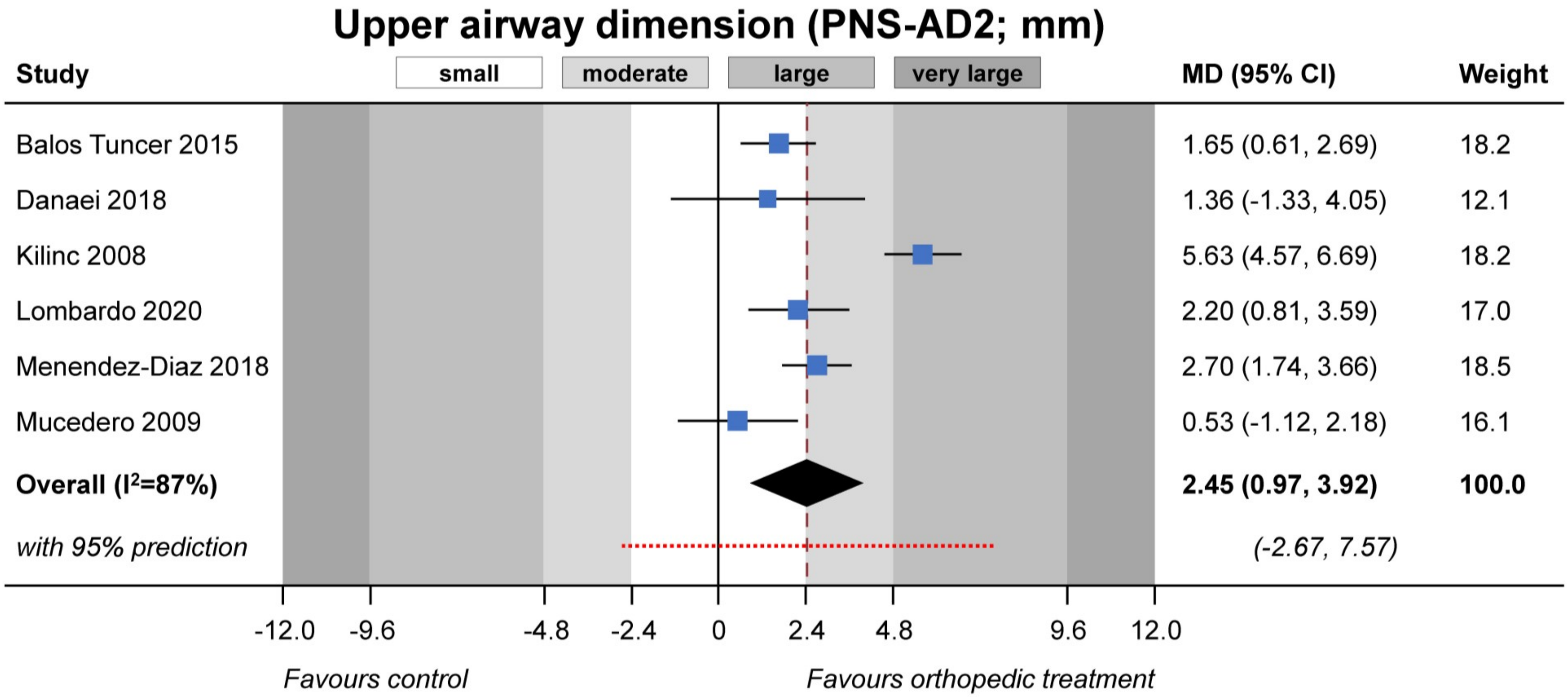
* from explanation of each landmark, consult the original studies.

CI, confidence interval; CR, clinically relevant (judged as effect being larger than one standard deviation of the control group pre-treatment); MD, mean difference.

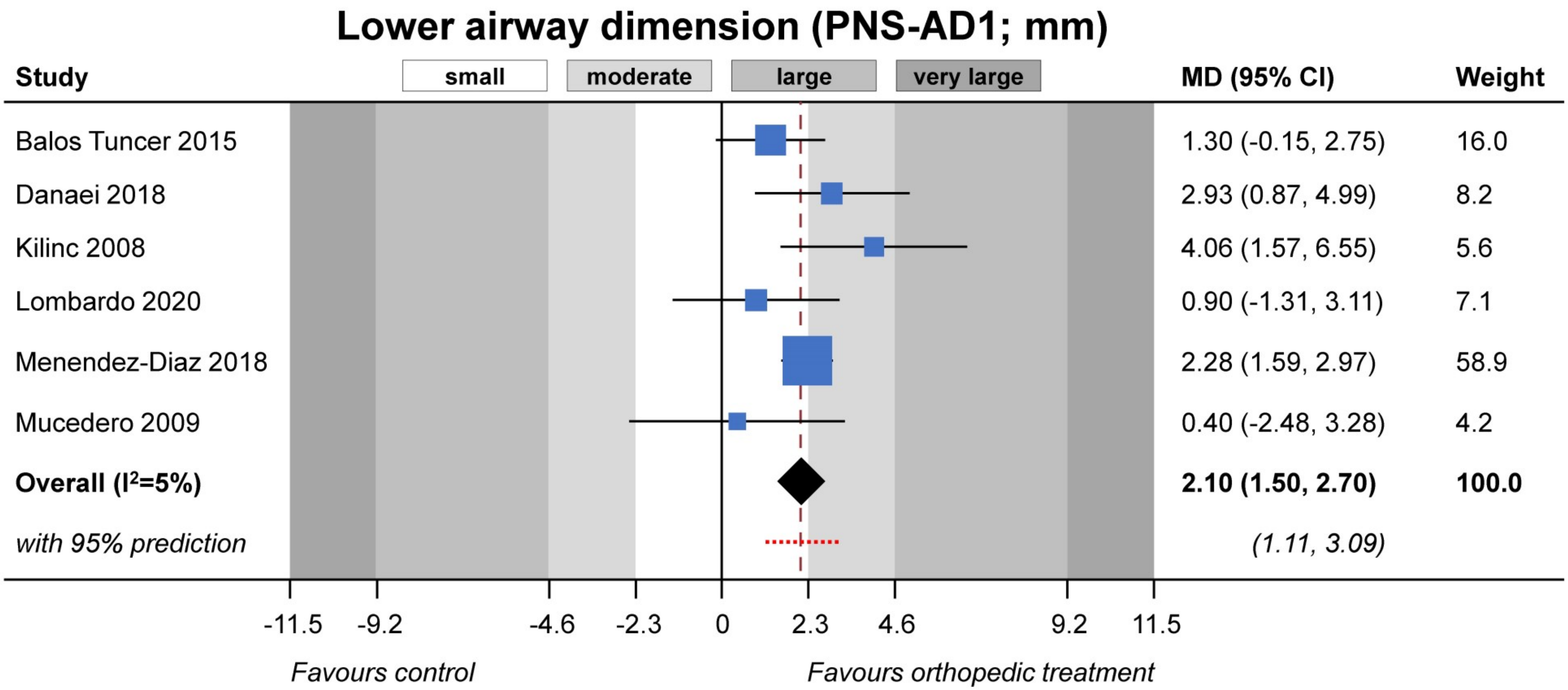
Supplementary Material S6. Contour-enhanced forest plot for the comparison of maxillary protraction with facemask versus changes in untreated controls in terms of total nasopharyngeal area.



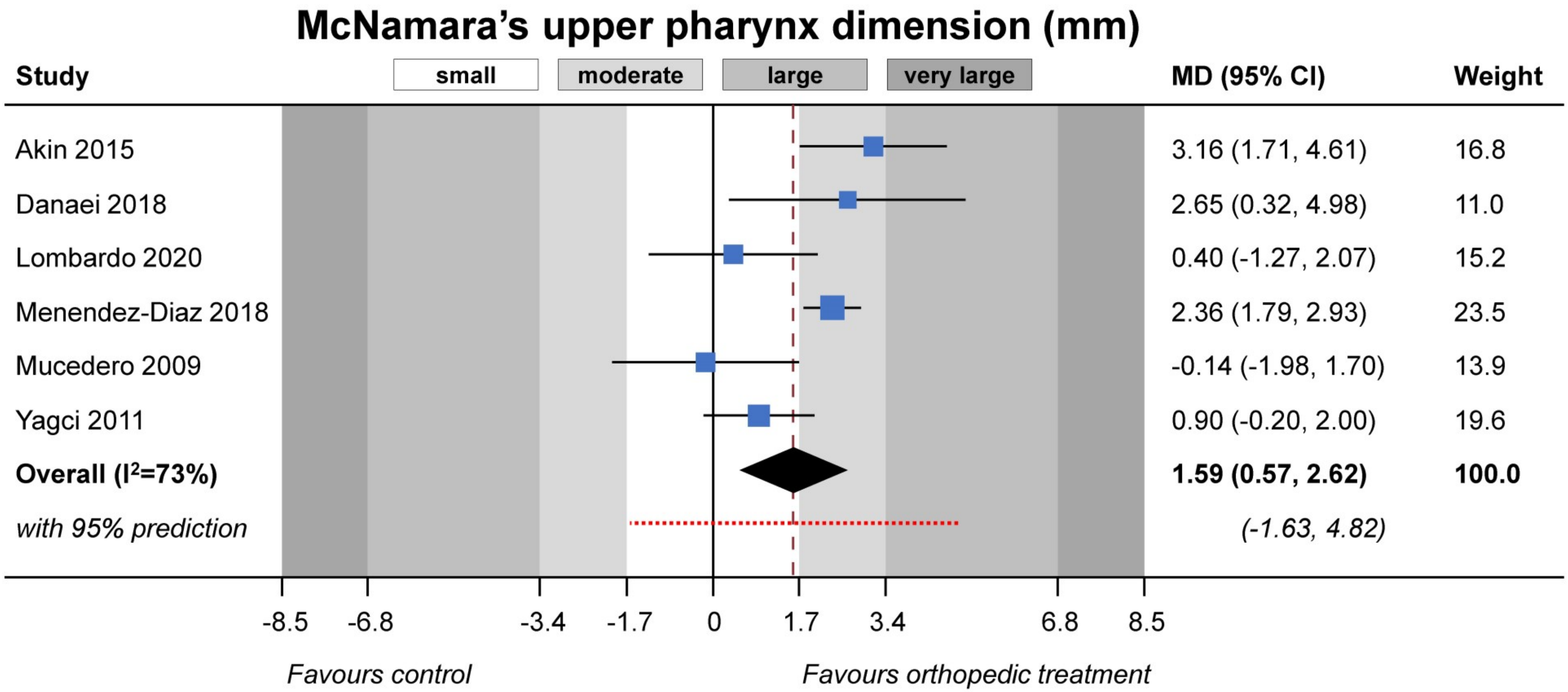
Supplementary Material S7. Contour-enhanced forest plot for the comparison of maxillary protraction with facemask versus changes in untreated controls in terms of upper airway dimension.



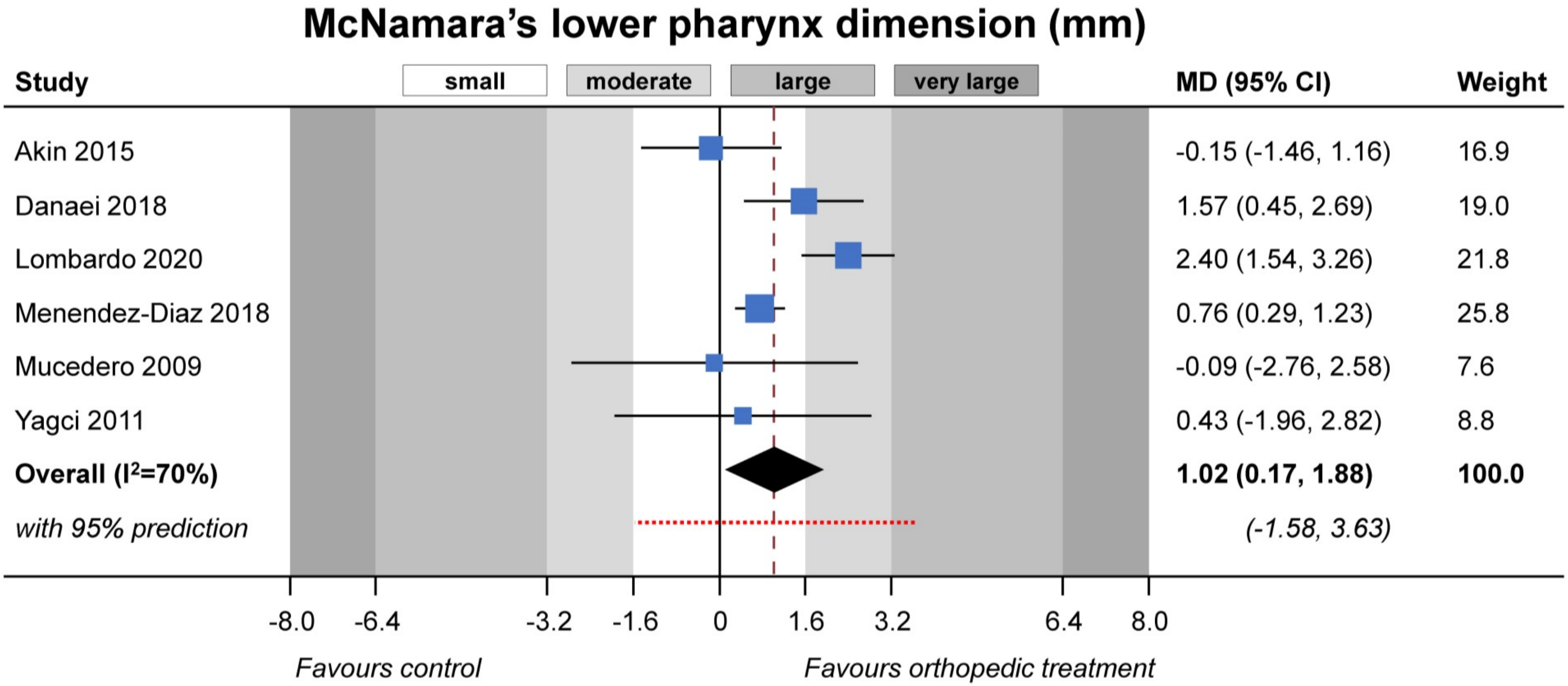
Supplementary Material S8. Contour-enhanced forest plot for the comparison of maxillary protraction with facemask versus changes in untreated controls in terms of lower airway dimension.



Supplementary Material S9. Contour-enhanced forest plot for the comparison of maxillary protraction with facemask versus changes in untreated controls in terms of McNamara's upper pharynx dimension.



Supplementary Material S10. Contour-enhanced forest plot for the comparison of maxillary protraction with facemask versus changes in untreated controls in terms of McNamara's lower pharynx dimension.



Supplementary Material S11. Results of individual studies comparing chincup to untreated controls that are not included in meta-analyses.

Nr	Study	Outcome*	MD (95% CI)	P	CR
1	Akin 2015	Nasopharyngeal area (adenoidal) (mm^2)	12.29 (-16.22, 40.80)	0.40	-
2	Akin 2015	Nasopharyngeal area (aerial) (mm^2)	-3.22 (-44.23, 37.79)	0.88	-
3	Akin 2015	Nasopharyngeal area (total) (mm^2)	9.08 (-23.74, 41.90)	0.59	-
4	Tuncer 2009	Nasopharyngeal area (mm^2)	10183.00 (10074.25, 10291.75)	**<0.001**	Yes
5	Tuncer 2009	Nasopharynx: AA'-Pm' (mm)	0.75 (-0.38, 1.88)	0.19	-
6	Tuncer 2009	Nasopharynx: Pm'-SPL (mm)	-0.28 (-1.97, 1.41)	0.75	-
7	Tuncer 2009	Nasopharynx: PNS-AD1 (mm)	1.59 (-0.95, 4.13)	0.22	-
8	Tuncer 2009	Nasopharynx: PNS-AD2 (mm)	-0.20 (-2.42, 2.02)	0.86	-
9	Tuncer 2009	Nasopharynx: PNS-S (mm)	0.35 (-1.01, 1.71)	0.61	-
10	Tuncer 2009	Oropharyngeal area (mm^2)	-8231.00 (-10616.52, -5845.48)	**<0.001**	No
11	Tuncer 2009	Oropharynx: AA-PNS (mm)	-0.18 (-1.94, 1.58)	0.84	-
12	Tuncer 2009	Oropharynx: eb-Peb (mm)	1.62 (-1.23, 4.47)	0.27	-
13	Tuncer 2009	Oropharynx: IPS (mm)	1.66 (-0.67, 3.99)	0.16	-
14	Tuncer 2009	Oropharynx: MPS (mm)	0.79 (-0.76, 2.34)	0.32	-
15	Tuncer 2009	Oropharynx: SPS (mm)	1.13 (-0.48, 2.74)	0.17	-
16	Tuncer 2009	Oropharynx: ve-Pve (mm)	0.57 (-0.75, 1.89)	0.40	-
17	Akin 2015	Lower pharynx dimension (mm)	-0.40 (-1.68, 0.88)	0.54	-
18	Akin 2015	Upper pharynx dimension (mm)	-0.25 (-1.61, 1.11)	0.72	-

* from explanation of each landmark, consult the original studies.

CI, confidence interval; CR, clinically relevant (judged as effect being larger than one standard deviation of the control group pre-treatment); MD, mean difference.

Supplementary Material S12. Sensitivity analyses of meta-analyses post-treatment with at least 3 studies.

		Sample size			**Baseline similarity (airways)**		
	Original	**Large**	**Small**		**Similar**	**Different**	
Outcome	**Effect (95% CI)**	**Effect (95% CI)**	**Effect (95% CI)**	**P**	**Effect (95% CI)**	**Effect (95% CI)**	**P**
Total nasopharyngeal area – (mm^2)	n=4 SMD=1.62 (1.20, 2.04)	n=0	n=4	-	n=2 SMD=1.97 (1.41, 2.54)	n=2 MD=1.34 (0.86, 1.83)	0.14
Upper adenoid size (AD2-H; mm)	n=3 MD=0.59 (-0.52, 1.70)	n=3	n=0	-	n=3	n=0	-
Lower adenoid size (AD1-Ba; mm)	n=3 MD=0.12 (-2.20, 2.44)	n=3	n=0	-	n=3	n=0	-
Upper airway dimension (PNS-AD2; mm)	n=6 MD=2.45 (0.97, 3.92)	n=3 MD=1.95 (0.74, 3.16)	n=3 MD=3.00 (0.21, 5.79)	0.45	n=6	n=0	-
Lower airway dimension (PNS-AD1; mm)	n=6 MD=2.10 (1.50, 2.70)	n=3 MD=1.71 (0.50, 2.92)	n=3 MD=2.52 (0.90, 4.14)	0.84	n=6	n=0	-
McNamara's upper pharynx dimension (mm)	n=6 MD=1.59 (0.57, 2.62)	n=3 MD=1.07 (-0.55, 2.69)	n=3 MD=2.11 (0.58, 3.65)	0.90	n=4 MD=1.38 (0.04, 2.73)	n=2 MD=1.98 (-0.23, 4.19)	0.80
McNamara's lower pharynx dimension (mm)	n=6 MD=1.02 (0.17, 1.88)	n=3 MD=1.26 (-0.10, 1.88)	n=3 MD=0.70 (-0.52, 1.93)	0.75	n=4 MD=1.37 (0.43, 2.30)	n=2 MD=-0.02 (-1.17, 1.14)	0.34

CI, confidence interval; MD, mean difference; SMD, standardized mean difference.